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ZINC OXIDE	5	5	5
STEARIC ACID	1	1	1
SULPHUR	1.8	1.8	1.8
'VULCAFOR' MBTS	2	2	2
'VULCAFOR' MS	1	1	1
TRITOLYL PHOSPHATE	20	20	20
DI-OCTYL ADIPATE	10	10	10
GRANULATED CORK	100	125	150
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		A	B	C
Resistance to Dry Heat (150 hours at 120° C.)				
Change in Length	%	—1.98	—1.86	—1.59
Resistance to Lubricating Oil (24 hours at 150° C.)				
Change in Length	%	—4.20	—3.60	—3.01
Resistance to Aviation Fuel (48 hours at 20° C.)				
Change in Length after immersion	%	+3.05	+3.37	+2.27
after drying	%	—1.28	—0.84	—1.23
Resistance to Ethylene Glycol (24 hours at 150° C.)				
Change in Length	%	—0.45	—0.44	+2.9

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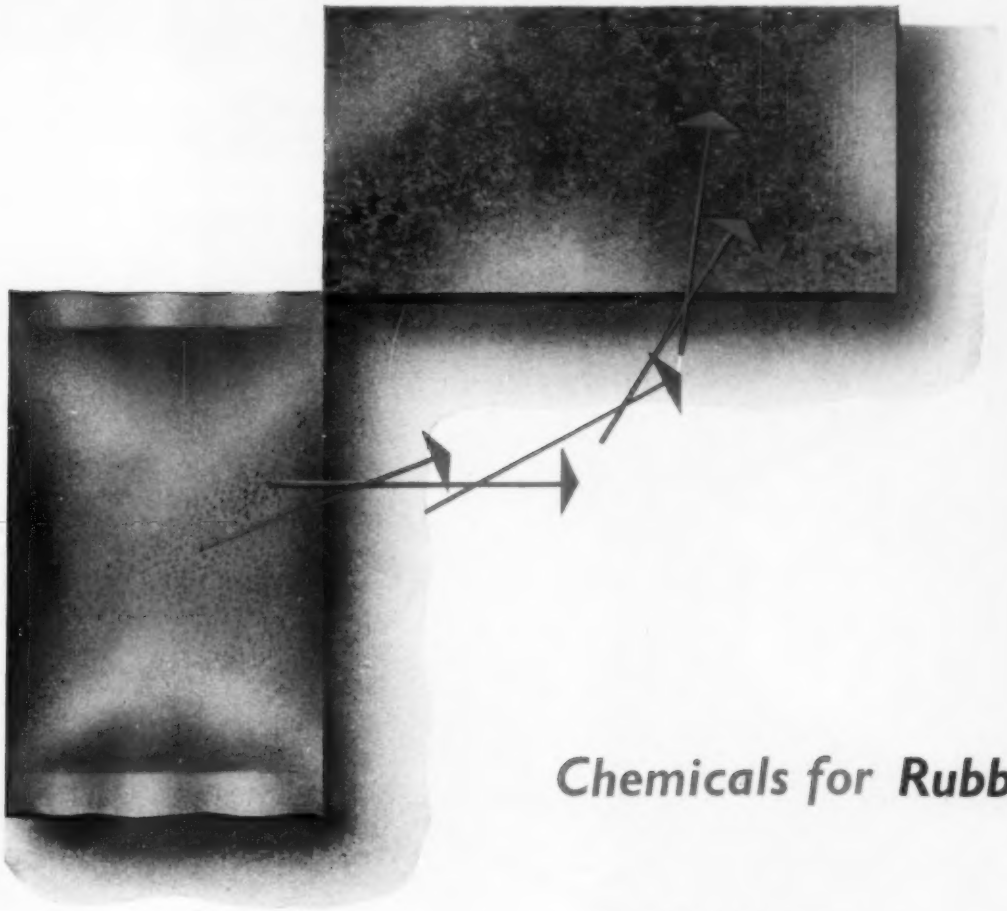

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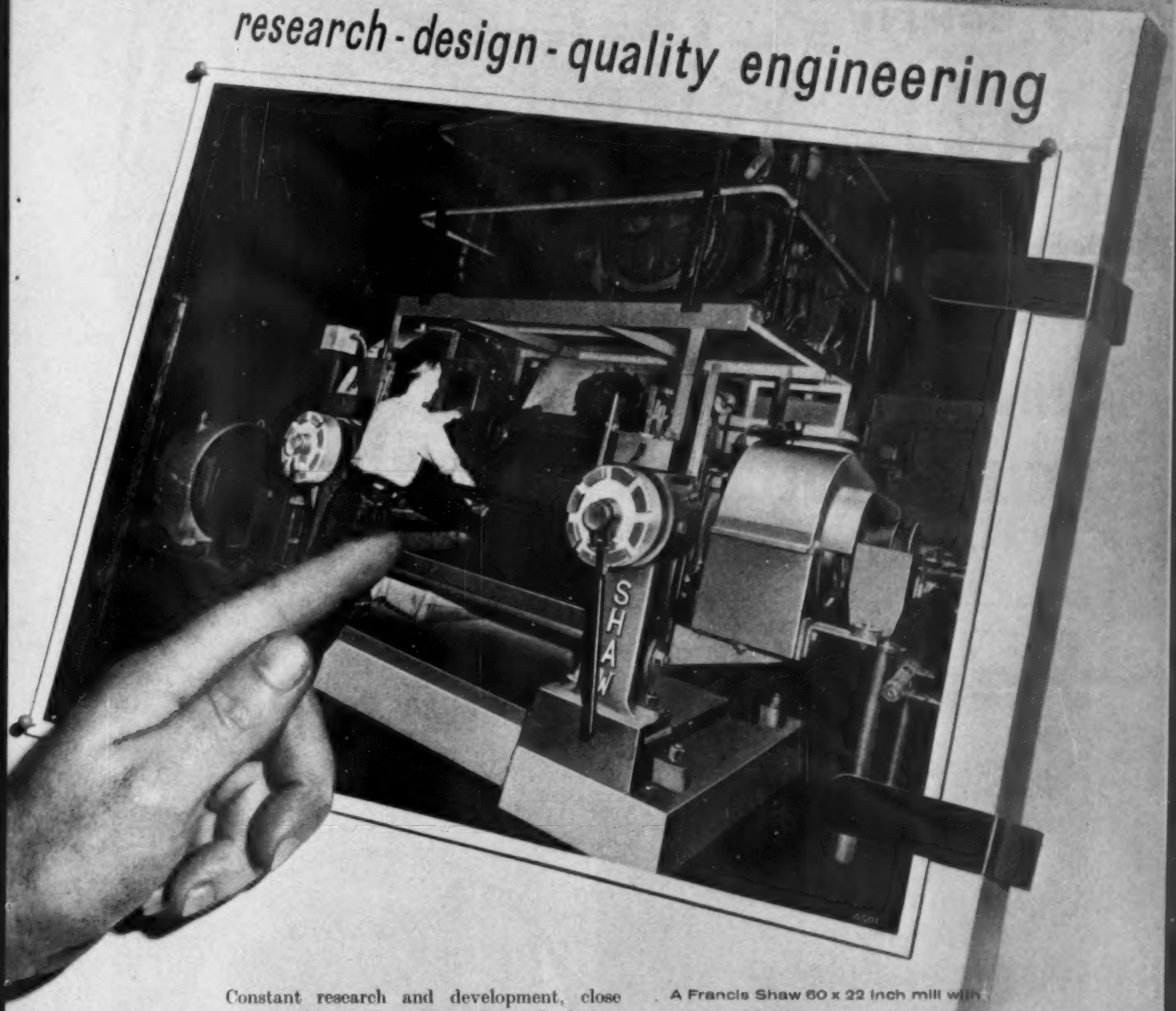

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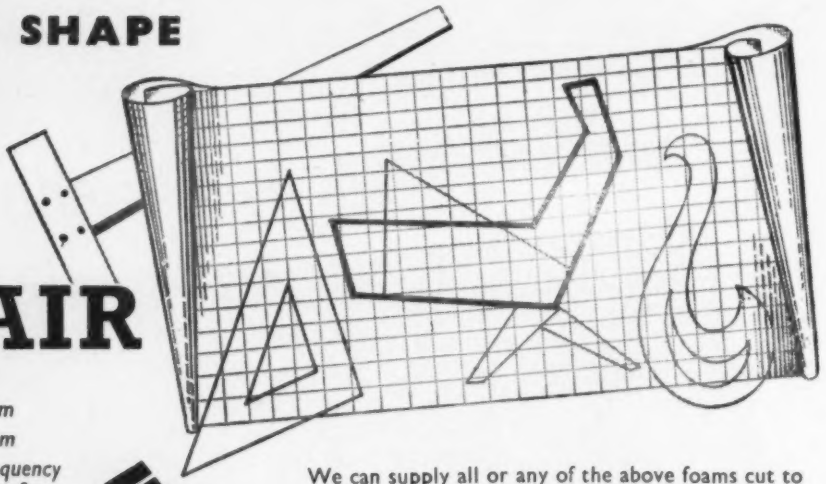

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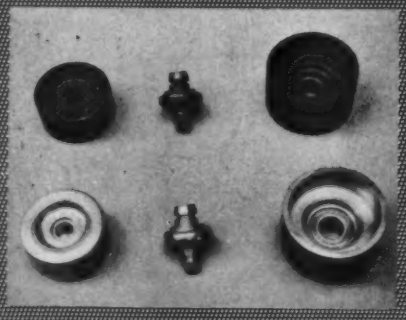

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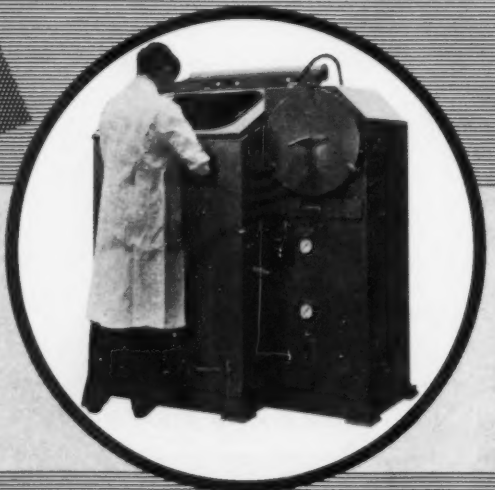

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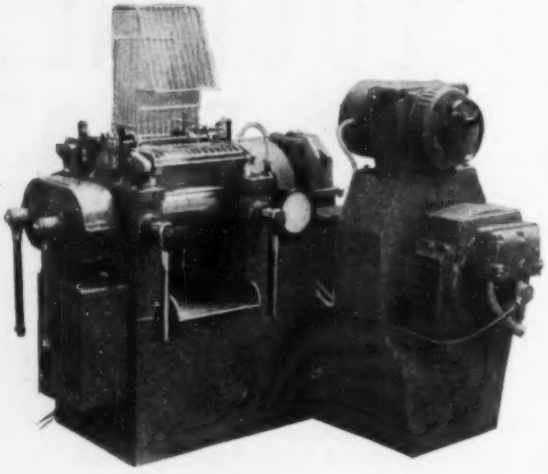

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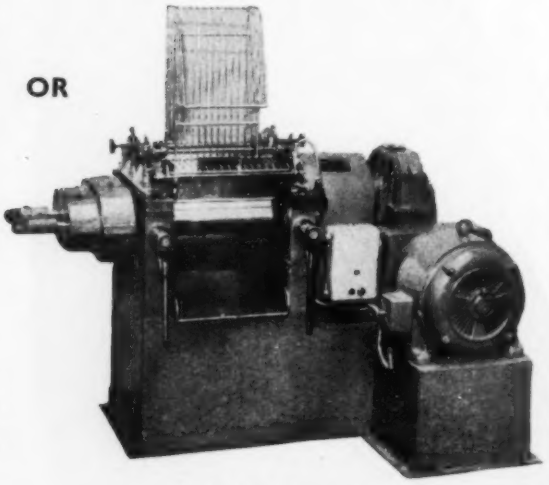

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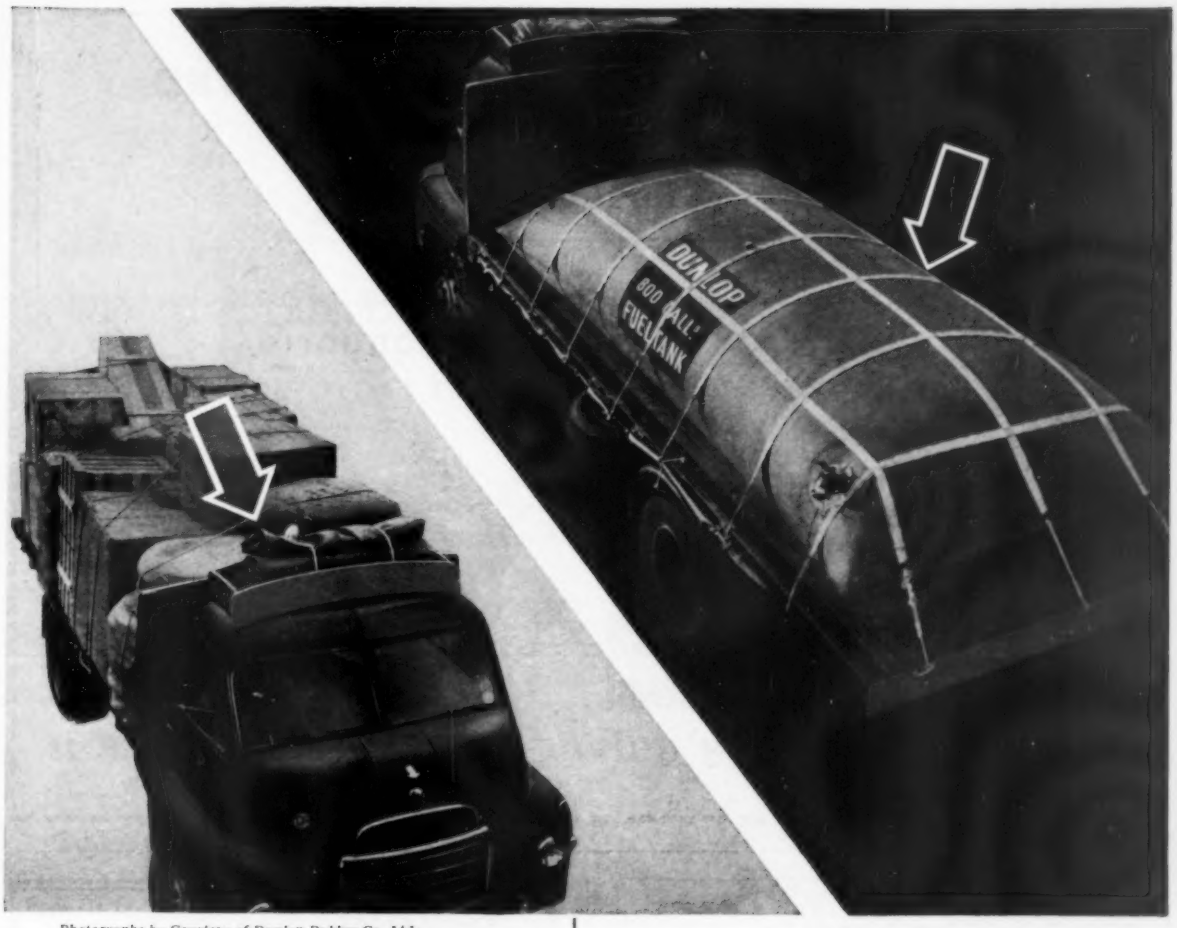

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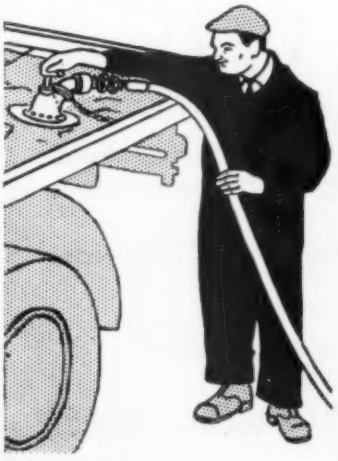
General Freight Haul

B——A
Auxiliary Fuel Tanker



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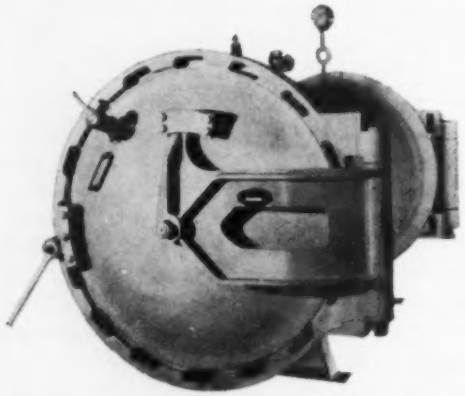

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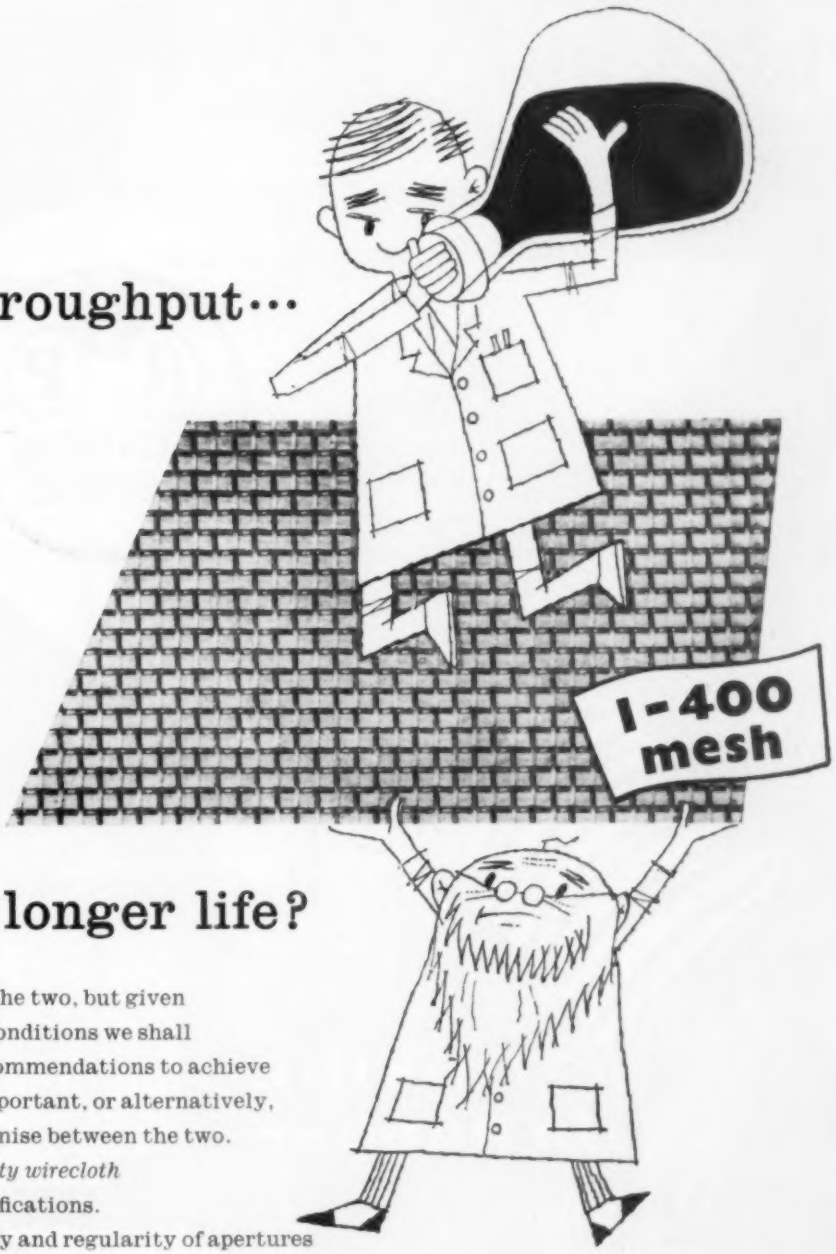

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IN ITS 77th YEAR

November 12 1960

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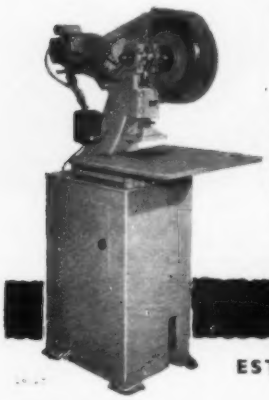

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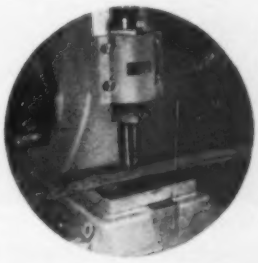

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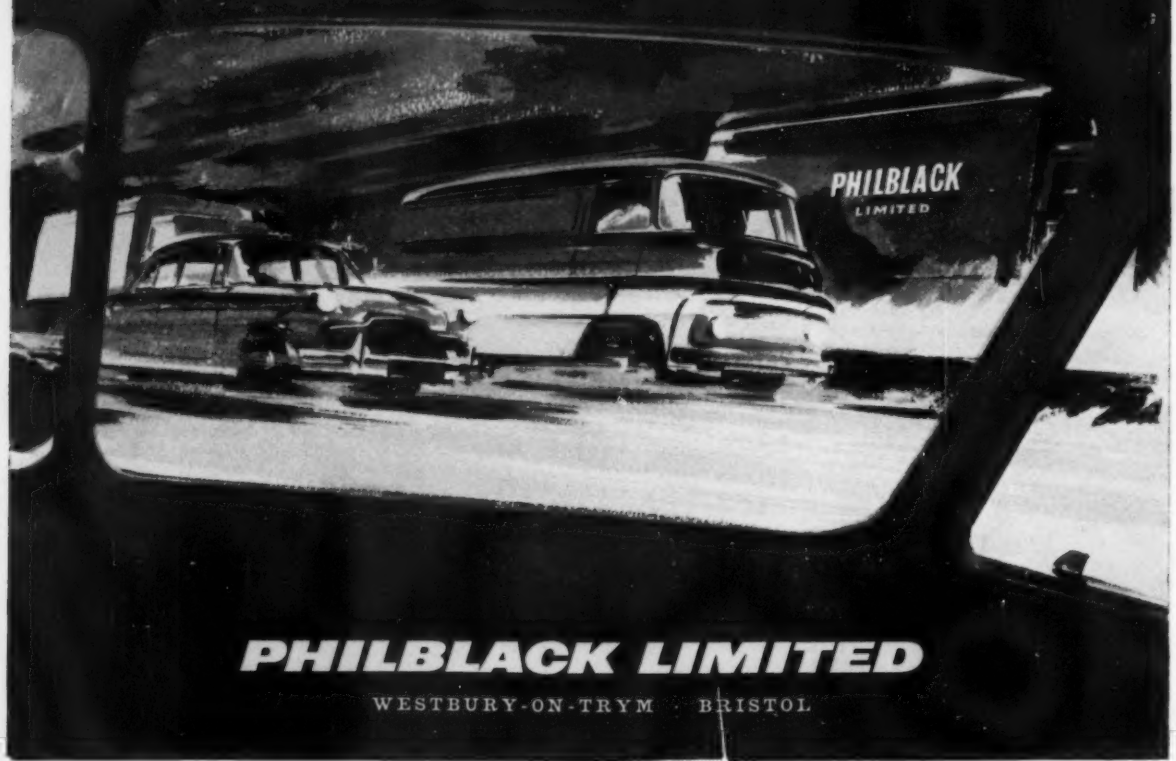

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TBA P3

NOTES of the WEEK

Pressures on Management

SOME pertinent observations on the increasing complexities of management were made recently by Lord Baillieu, president of the Dunlop Rubber Co. Ltd., in a speech at the House of Lords in debate on the responsibilities of Management in Industry and Commerce. He referred to the great changes which had taken place in our way of life since the beginning of the century which had had a profound effect on the dynamics of enterprise. A business, he said, was no longer a purely private concern. It was a social institution as well as a profit-making enterprise. Such a development clearly affected the role of the Manager. There was a time when his position was clear. He was not confused as to either objectives or methods. The Manager's function was to bring together and properly co-ordinate the elements involved in the production and distribution of goods and services. He was vested with the power to command and, by keeping the cost of all elements at a minimum, and employing labour to give maximum productivity, he was able to increase profits.

' Now ', said Lord Ballieu, ' the Manager finds that his role has been considerably altered. He is under pressure from many quarters and is having to deal with new forces and with changed motivation in people. He is no longer in absolute control of the situation, and is less able to use his power and authority to get the job done. On the one hand, the Manager's authority is being challenged by the growing power of the unions and the specific restrictions imposed by the labour contract. On the other hand, he is faced with an ever-increasing number of governmental codes, regulations and limitations. Also, because business is so highly integrated and dependent upon a network of companies and industries, his effective co-ordination of the elements in production is, to a considerable extent, in the hands of many suppliers, distributors and sub-contractors. Finally, in this present stage of almost instantaneous mass communication, he is increasingly dependent on the growing power of public opinion '.

During the next decade, concluded Lord Baillieu, the Manager will be faced with the problem of reconciling the proper conduct of his business with the mounting external pressures from various sources. Success will depend on his ability to explain and persuade and thereby secure the active co-operation of all concerned.

Change and Expansion

THE results of meetings to be held during the next fortnight will have big effects on two of the best known organizations in our industries, the Research Association of British Rubber Manufacturers and the Federation of British Rubber and Allied Manufacturers. On November 15, an Extraordinary General Meeting of RABRM will be held in London to consider, among other resolutions, the changing of the name of the Association to ' Rubber and Plastics Research Association of Great Britain '. The Association already engages in a fair amount of plastics research, inevitably because, as has been said many times, there is no difference, technologically speaking, between polymers labelled ' rubber ' and polymers labelled ' plastics '. It will not do to anticipate the outcome of next week's meeting but it is no secret that research on plastics materials at Shawbury has been increasing, not least because of the increasing use of plastics by companies ' officially ' in the rubber industry, and will increase further. It is reasonable to expect that companies engaged entirely in the plastics industry, or allied to it, will wish to take advantage of the immensely valuable, indeed essential, work being done by RABRM and enable that work to be extended.

Matters to be discussed on November 24 at the Council Meeting of the FBRAM will concern the direction which the Federation is to take in the years ahead. The result of the meeting will be of very great importance to all rubber manufacturers for the Federation does a really first-rate job. It is an excellent representative of the industry it serves and is among the relatively few industrial federations which has a mind of its own and really gets things done.

A Matter of Health

THE Health Conference organized by the Health Advisory Committee of the Rubber Manufacturing Employers' Association, and to be held next week in London (details are reported elsewhere in this issue), is a most valuable move by this energetic and enthusiastic association. The work of the association in the field of safety has already put the record of the rubber industry ahead of most others in this respect, and the emphasis now being placed on health is one more sign of the farsightedness of the RMEA executive and its appreciation of ' human relations ' in the fullest sense of the term.

NEWS *Briefs*

PECHINEY PVC IN ARGENTINA — SBR TALKS IN SOUTH AFRICA — CZECH PLANT ORDER FOR UK DUTCH PLASTICS OUTPUT—MALAYAN EXCHANGE

●**South Africa** — The technical and economic feasibility of the domestic production of synthetic rubber is to be examined by the Synthetic Rubber Development Co. of South Africa. Associated in the new company are: Bonusbeleggingskorporasie van Suid-Afrika; Dunlop (SA); Federale Volksbeleggings; Firestone (SA); General Tire (SA); Goodyear (SA); the Industrial Development Corp. (SA); South African Rubber Manufacturing Co. The new company will investigate matters such as the possible future market, likely raw material supplies, the most practical and economic site, and likely developments in types and qualities of synthetic rubber.

●**Argentina** — Argentina's Ministry of Economy has approved a capital investment proposal by the French company Péchiney of NF 605,981 and 46,000 Swiss Francs through the local company Indupa. This will be used to buy machinery and equipment, catalysts, control and regulating apparatus, piping, accessories and spare parts for the manufacture of polyvinyl chloride.

●**Holland** — According to the 1961 budget for the Netherlands State Mines in Limburg, total production of the various plastics will be raised to 35,000 tons, as compared to 21,000 tons in 1959; the increase being the greatest in the production of caprolactam and polythene.

●**Czechoslovakia**—High Polymer and Petro-Chemical Engineering has signed a contract for a nylon tyre cord plant with Strojimports and Polytechna, of Prague. The contract is worth approximately £1m. The equipment will largely be manufactured in the UK by Vickers-Armstrong.

●**United Kingdom** — Sales from the Board of Trade's stock of natural rubber in October totalled 1,539 tons for delivery: spot 145 tons, November 256 tons, December 893 tons and January 245 tons. Rubber still available for sale totals 29,485 tons.

●**Ceylon** — A trade delegation from the United Arab Republic is due to arrive in Ceylon shortly to conduct negotiations on a trade agreement which includes the exchange of Ceylon rubber for rice from the UAR.

●**United States** — Production and sales of polyester resins are expected by industrial sources to reach record levels this year, although increases over 1959 will be limited by a moderate drop in some of the traditional major markets. Production is estimated at about 190m. lb. against 188m. lb. last year, and sales at 170m. lb. against 169m. lb. in 1959. Further gains are looked for by some quarters in 1960. These estimate sales at around 186m. lb. and expect production to reach 200m. lb.

●**Holland** — N. V. Thomassen and Drijver of Deventer is extending its interest in the production of plastics packaging materials by acquiring shares in A. E. Ruys Haarlem N.V. Thomassen produces plastics bottles while Ruys manufactures packaging film.

—510

●**Malaya** — The rubber exchange which it is proposed to set up in Kuala Lumpur (*RJIP* November 5, 764) may be functioning by the end of next year, according to a spokesman of the Malayan Ministry of Commerce and Industry. He said that such an exchange would end the monopoly of the Singapore market and eliminate many premium costs for Malaya.

●**United Kingdom**—Esso Petroleum is hoping that petrochemical industries will be attracted to Pembrokeshire following the construction of its £18m. refinery at Milford Haven. The refinery was opened on November 3.

●**United States** — Natural rubber latex can be custom tailored for a wide variety of finished products by exposing it to radiation at plantation level, a Goodyear research team reports. The team used Cobalt-60 gamma rays and found that irradiation of the latex provides a practical and economical method of improving the properties of the polymer for a wide range of commercial applications. For example, extrusion flow properties of irradiated rubber are claimed to approach those of superior processing rubber.

●**Germany** — The Esso refinery at Cologne is reported to be planning a DM50m. extension in the near future concentrating primarily on the extension of plants for olefine production. Hitherto olefine production has made up only 7% of the refinery's operation; this will be increased to 14%.

●**Italy**—The Anic refinery at Gela, Sicily, will come on stream soon. It will have a processing capacity of 3m. tons of local crude oil from which petrochemicals will be obtained. Anic's synthetic rubber plant at Ravenna, which is nearing completion, will have a capacity of 90,000 tons. Also at Ravenna Phillips Carbon Black Italiana, in which Anic has an interest, is constructing a carbon black plant.

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Press a rubber cushion. It gives; adapts itself to take varying pressures. A Technical Service should do much the same thing. I.S.R., the makers of Intol SB Rubbers, realize that no two rubber users have precisely the same problem. They provide a service that's versatile. The kind of Technical Service that rubber users want.

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Reed Plastics Development

PAPER GROUP FORMS NEW PACKAGING COMPANY

ALBERT E. Reed and Co. Ltd., the paper group, is extending its interests in packaging and has entered the field of plastic containers by establishing a company called Reed Plastic Packaging Ltd.

Reed will hold 60% of the capital of this new concern, the remainder being held by Polythene Drums Ltd. of Middlesex, whose proprietors have agreed to merge their interests in packaging with those of the Reed Paper Group.

Managing director will be F. J. Clark (a director of Reed and chief executive of the Reed packaging division).

Other directors will be R. F. Seddon and J. H. Seddon (who were pioneers in Europe of thin wall blown polythene containers and the founders of Polythene Drums Ltd.); L. G. Groves (general manager of the Reed packaging division development department); J. B. Purkis (commercial executive of the Reed packaging division); and J. W. O'Field (at present a director of Polythene Drums Ltd.).

New Range of Containers

The new company will market a range of standard plastic containers initially in 5-45gall. sizes, and is to introduce a new range of fibreboard-clad polythene containers which will be marketed by Reed Corrugated Cases, another member of the Reed packaging division.

Commenting on the move into the plastic packaging field F. J. Clark said:

'Already an established leader in the paper and board packaging industry, the Reed Paper Group has for some time recognized the growing potential of plastics as a packaging medium. I am certain that this move, which is another step forward in our overall policy of providing a really comprehensive packaging service to industry, will prove of benefit not only to the group but to industry as a whole.'

Reed already has an interest in plastics, as one of the members of the group is the Maidstone firm Holoplast, which produces laminated plastics.

Cintura Tyres for Volvo

Pirelli Cintura tyres, manufactured at Burton-on-Trent, will be fitted as original equipment on the Volvo P.1800, the new Swedish sports car to be assembled in the Midlands. Production is due to begin in January.

Specifically designed for cars capable of high performance, the unconventional Cintura tyre, with its rayon radial casing and circumferential belt, has claims of exceptionally good road holding qualities made for it. The Volvo P.1800 is the first to be equipped with tyres of this type made in Britain.

Dunlop Gift to Birmingham University

Dunlop Rubber Co. Ltd. have entered into a Deed of Covenant to pay £10,000 a year for seven years to Birmingham University. This donation has been made in answer to an appeal from the University who are planning to raise £1,638,250 for the purposes of building new Halls of Residence. Today Birmingham has 460 students in residence out of a total of 4,000. By 1965, the total number of students should be between 5,000 and 5,500 and the University plan to raise the number of residential places up to 2,000.

SD Get Witco Contract

PHTHALIC PLANTS IN FRANCE AND USA

SCIENTIFIC Design Co. has received the contract for engineering and construction of Witco Chemical Co.'s Eastern phthalic anhydride plant. The 30m. lb. per year plant is scheduled for completion before the end of 1961.

Witco's first phthalic anhydride plant went on stream in Chicago early this year. This 20m. lb. per year plant was also designed and constructed by Scientific Design.

The same company has also announced that the first SD phthalic anhydride plant using ortho-xylene as initial feedstock is now being designed and constructed for Compagnie Française des Matieres Colorantes (Francolor), Villers-St.-Paul. Engineering and construction will be performed in France by a member of the SD group, Société Française des Services Techniques.

The plant will be designed for ortho-xylene, but will be fully convertible to naphthalene, will provide high yields on either feedstock, and, it is claimed, will be the simplest of plants to operate.

The phthalic anhydride plant under construction for Staatsmijnen in Limburg, Geleen, Holland, brings to four the number of SD designed phthalic plants utilizing an SD process.

New Dowty Company

A new company has been formed under the title of Dowty Technical Developments Ltd. to undertake advanced project work for the Dowty group. The Board consists of: Sir George Dowty, chairman, T. D. H. Andrews, managing director, D. G. A. Thomas and J. E. Price, secretary.

The company will operate from Brockhampton Park, Andoversford, Glos. The new registration brings the total number of Dowty group subsidiaries to 22.

European Capital in Polymer Expansion

Canadian Defence Production Minister Raymond O'Hurley said that UK and French capital will total about half of the amount to be spent by the crown-owned Polymer Corporation in the European part of its expansion scheme. Last week Mr O'Hurley announced plans for a $40m. programme which included a 'speciality rubber plant in France and a butyl plant in the UK.' (*RJIP* Nov. 5, 761.)

The Minister said this was not a condition laid down by either country; the Canadian Government believed more interest in the two plants proposed would be created by having British and French capital invested in them.

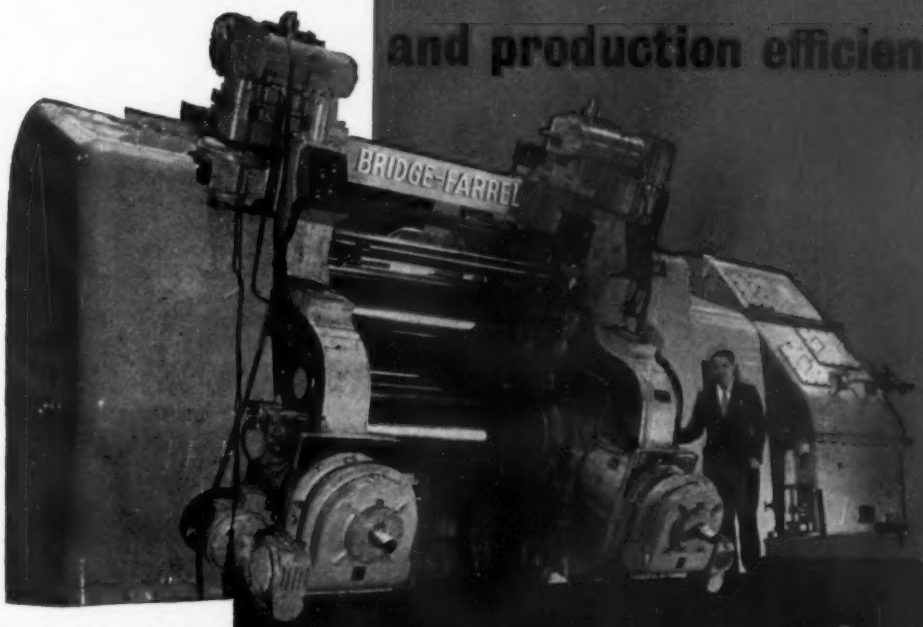
He added that Canada will retain just over 50% of the shares of the two proposed companies.

Brake Bonding Adhesive

CIBA (ARL) Ltd. announce the addition of Redux 68 to their range of brake bonding adhesives. It has been developed for bonding all types of friction materials to operate at bond line temperatures over 350°C.

BRIDGE FARREL equipment

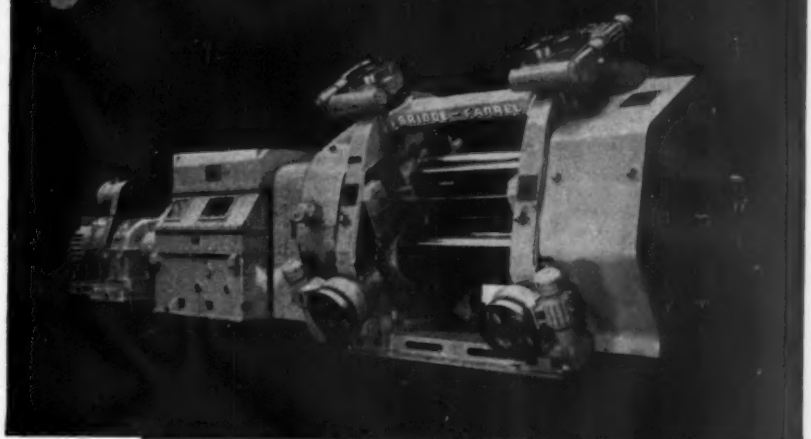
. . . acclaimed as the ultimate in design and production efficiency



28" x 74" Inclined 'Z' Plastics Calender.

Advanced engineering features include patent hydraulic loading on the final nip and all the finest features of Plastic Calender Design.

BRIDGE-FARREL calenders give tolerances of ±.0001" on thin calendered plastic film at speeds up to 320ft. per minute.



Bridge-Farrel 24" x 66" 3 Roll Triangular Calender. The illustration shows one of several recently built and in operation, and considered to be the fastest precision Rubber Calenders in the world.

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MacroPlastic Exhibition

PLASTICS DEVELOPMENT IN THE NETHERLANDS

THIS second international exhibition of plastics ever to be held in Holland was more than twice as large as the first, held in Amsterdam three years ago. During a speech made at the opening ceremony Mr G. G. Meester, director of NV 't Raedthuys the organizers of the exhibition, said that one thing that had become evident since the last exhibition was that an internationally co-ordinated presentation of all the facets of the subject, and particularly a demonstration of the many possible applications, was a decisive factor in the progressive use of plastics in the world today. He stressed the international nature of the exhibits which could be gathered from the following percentages giving the proportion of exhibits from the main countries participating: Holland 31%, Western Germany 26%, Great Britain 13%, and Belgium 11%. This he compared with other international exhibitions where the tendency was rather towards a national demonstration with an international fringe, as for example as Dusseldorf in 1959 when 73% of the exhibits were of German origin.

Mr J. van de Ven of the Institute for Plastics TNO, Delft, then described the development of the plastics industry in Holland which he said had been flourishing for 15 years. Until very recently most raw materials had been imported, but now Dutch production could partly, and in some cases completely, satisfy the home demand for some of the most important of these.

Reliable Materials

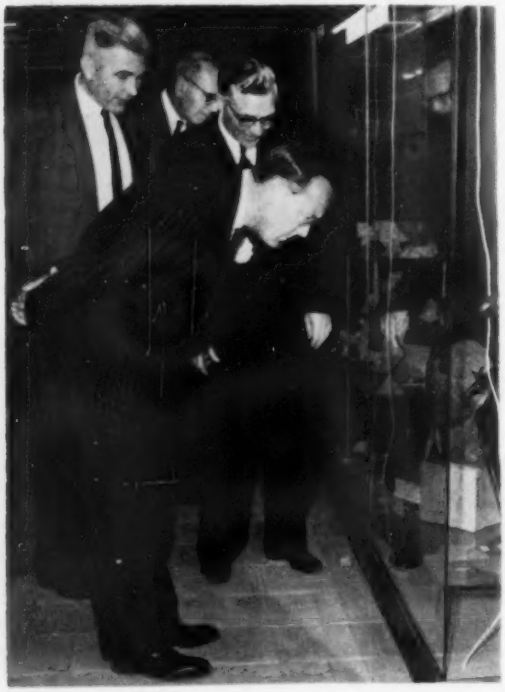
The paint and varnish industry remained the most important and was responsible for 26% of production, but more interesting was the fact that plastics had been accepted as reliable materials in many applications both for domestic and household uses and for numerous other less obvious but equally indispensable products. As examples he quoted transport and communications, building and road and waterway construction, where plastics had proved to be preferable to some conventional materials.

This acceptance of plastics was, he said, largely due to the research work in the field of application and manufacture, both in the Netherlands and abroad. It was essential that extensive research should continue because the number of different plastics was always increasing and it was important that plastics should only be used when their properties were known and then used only in the right way.

Dr G. A. Kohnstamm, chairman of the committee for the Congress on the technology of plastics processing which took place in Amsterdam immediately before the exhibition (*RJIP* October 29, 726) paid tribute to the hard work done by the organizers in arranging the first macroPlastic in 1957, and then following this up with a much more ambitious project which he was sure would be equally successful. He looked forward to seeing many of the visitors returning to their homes with the firm intention of coming back again in three years for macroPlastic III. The exhibition was certainly a triumph for the organizers and from the point of view of the Dutch exhibitors and visitors as it indicated very clearly that the Dutch plastics industry has made tremendous advances in the last few years and is now definitely on the map.

General opinion seems to be that there are too many technical and trade exhibitions and the decision by the European Economic Community countries to arrange a calendar so that each member has an opportunity to organize a fair in turn is an extremely good one. The separation of EEC and EFTA is emphasized by the fact that next year there are two exhibitions that actually overlap by four days. Europlastica in Ghent from June 16 to 25 and Interplas in London from June 21 to July 1. This is a point on which the two groups could perhaps come to some agreement to their mutual benefit, and indeed to the benefit of the many people who attend the majority of these exhibitions.

It is inevitable, under the present system where there are such frequent exhibitions, that many of the items on show are not new and in this respect macroPlastic was no exception.



Prince Bernhardt examining a display of sculpture in plastics by Dutch artists. Accompanying him are (*left*) Dr M. Slee of Philips and Mr G. G. Meester director of NV 't Raedthuys, organizers of the macroPlastic Exhibition

Rubber and Plastics

One interesting feature of the show as a whole was the number of firms on whose stands were to be found many synthetic rubber goods. This is perhaps an indication of the

THESE ARE NONOX *DAYS*

Industry constantly seeks to improve its processes, to find new methods and products even more suited to the demands of modern times than those already in use. This urge to advance has included a great deal of research in the field of antioxidants for rubber, work that has continued over the past 30 years in the laboratories of I.C.I.

Antioxidants for rubber are conventionally divided into two classes, the non-staining and the staining. The non-staining types are in particular demand for use in light-coloured rubber articles because they cause very little discoloration on exposure of the article to light.

Whereas staining antioxidants are predominantly aromatic amines, most non-staining antioxidants are phenolic. Relatively simple phenols are, in fact, antioxidants. Some 30 years ago I.C.I. were early in this field with their product Nonox W, essentially β-naphthol. This has since been replaced by a range of non-staining antioxidants of greater flexibility and efficiency.

It was found possible to avoid the known retarding effect on vulcanization of simple phenols by the use of more complex phenol derivatives. Nonox NS, and Nonox NSN which later supplemented it, are both of this type and were first developed in the 1930s. The non-staining properties of these products proved extremely good and further developments were aimed principally at gaining increased efficiency.

Notable advances were made during the second world war but it was not until 1948, when Nonox EX first became available, that these could be implemented. Although not quite maintaining the excellent non-staining properties of Nonox NS/NSN, Nonox EX gave significantly greater efficiency and set a pattern for more widespread use of non-staining antioxidants by the rubber industry. Similar products are Nonox EXN and EXP which differ from Nonox EX principally in physical form. Nonox EXP, in particular, provides a most attractive bead-form which is easily and cleanly handled.

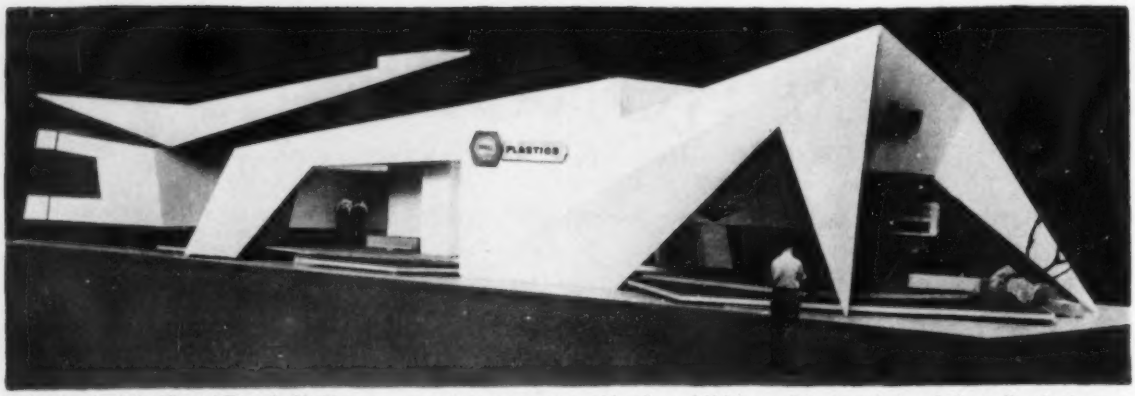
Remarkable for the combination of efficiency with excellent non-staining properties is Nonox WSL. Although differing chemically, Nonox WSL is a substituted phenol, and resembles Nonox EX in all fields of efficiency except possibly heat resistance. A later product, Nonox WSP, is chiefly of interest because of the high degree of protection that it confers. Nonox WSP and WSL have proved of particular value in latex articles (such as foam) and mechanicals. It may be noted that Nonox EX/EXN/EXP are resinous and not easily used in latex processes.

The latest addition to the I.C.I. range is Nonox CNS. This product was developed principally as a non-staining copper inhibitor, i.e. an agent that counteracts the deleterious effects of metals such as copper and manganese on the ageing of rubbers. Nonox CNS is a synergistic mixture of, essentially, two agents, one reinforcing the effects of the other. Non-staining copper inhibitors are of interest in the manufacture of cable insulation and proofings. Nonox CNS is also a most effective antioxidant.

The I.C.I. range of non-staining antioxidants will not stand still. Out-dated products will be deleted and new products added as discoveries are made. The progress since the days of Nonox W has been substantial.

IMPERIAL CHEMICAL INDUSTRIES LTD., LONDON, S.W.1

Advertiser's announcement A193



This stand of the Royal Dutch Shell group was the most unusual in the exhibition. Displayed simply but effectively were the five main groups of products: synthetic rubbers, epoxy resins, polystyrene, polyolefines and PVC

trend towards a closer integration of the plastics and rubber industries which has already been suggested in this country by the proposed combination of research effort at the Shawbury laboratories of the Research Association of British Rubber Manufacturers.

There were more than 20 exhibitors showing a wide range of mouldings and extrusions in various synthetic rubbers and there were also several stands with foam products of various types including polyester, polyether, SBR and SBR/natural blends. Heybroek and Co's Handel Maatschappij NV and at least one other exhibitor were displaying mouldings made from natural rubber and rubber latex.

As suggested by Mr van de Ven in his speech at the opening, plastics have been accepted in Holland and this was clearly indicated by the very wide range of household and domestic mouldings and toys displayed on many of the Dutch companies stands and the interest taken in them. The attitude of the Dutch towards plastics is obviously not the same as in this country, where to many people the word plastics implies something synthetic or ersatz and therefore inferior in quality. This is also shown in the reluctance of many British companies to use plastics in applications where they would be better than conventional materials.

Plastic Piping

One example of this difference is in the use of PVC and polythene piping for domestic, industrial and agricultural water supplies and for guttering and rainwater goods. Polythene and PVC pipes were exhibited on over 40 stands, and only a handful of these were of British origin. Comptoir des Fers et Metaux manufacture extruded PVC pipes in diameters up to 7in. and sold, for convenience, in lengths of 12 metres (39ft.). These have a post formed end and a pressure-tight joint is easily made by inserting the straight end of another pipe with a simple rubber gasket.

The stand of Wavin NV included an impressive display of PVC piping of varying diameters and joints for connecting them, and also showed the wide variety of bends, joints and junction units manufactured by the company. This firm recently extruded and laid a large diameter pipe in lengths of 350ft. which demonstrates that the basic problem in this application of plastics is not imposed by the nature of the material.

Part of the Chemische Werke Hüls stand on which were displayed a variety of articles made from the wide range of plastics and rubbers manufactured by the company

RMEA Health Conference

A Health Conference, organized by the Rubber Manufacturing Employers' Association, will be held on November 17 and 18 in the Connaught Rooms, London, under the presidency of Mr G. E. Beharrell, chairman of the Dunlop Rubber Co. Ltd. Mr F. I. Tuckwell, chairman of RMEA, will be conference chairman.

Speakers over the two days will include Mr T. W. McCullough, H.M. Chief Inspector of Factories; Dr H. G. Parkes, RMEA medical officer; Dr W. T. Jones, medical officer of Birfield Industries Ltd.; Mr Alistair Heron, Medical Research Council, Liverpool, and Dr Michael Williams, Imperial Chemical Industries. A panel discussion will be held on the afternoon of the second day, the panel being composed of the RMEA Health Advisory Committee under the chairmanship of Mr Tuckwell. A reception and dinner will be held on November 17.

Underwater Plastics

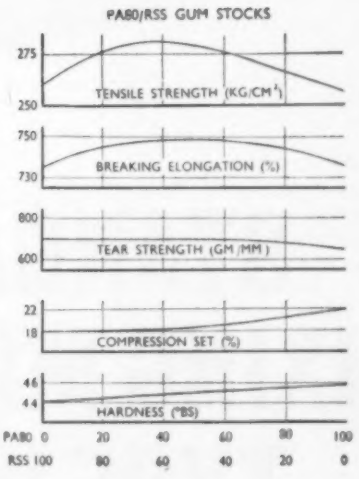
A big order (over 11,000 sq. ft.) for Bakelite's Warerite aluminium has been placed by Vickers. The material — laminated plastics bonded to an aluminium core — is to be installed in *Dreadnought*, Britain's nuclear submarine.

The latest addition to the family

. . . is a SPLENDID MIXER

PA 80 RUBBER, latest addition to the family of SP rubbers from Malaya, mixes happily with any grade of natural rubber or with general purpose synthetic rubbers, and what a good influence it is!

How PA 80 maintains quality is shown in the graph for blends with RSS in a pure gum stock. It may be used to meet exacting specifications in extrusion compounds, to control shrinkage of calendered sheet, to firm up very soft stocks, to reduce air trapping in difficult mouldings, etc. If there is a difficult job to do in the factory SP rubber or PA 80 may well be the answer.



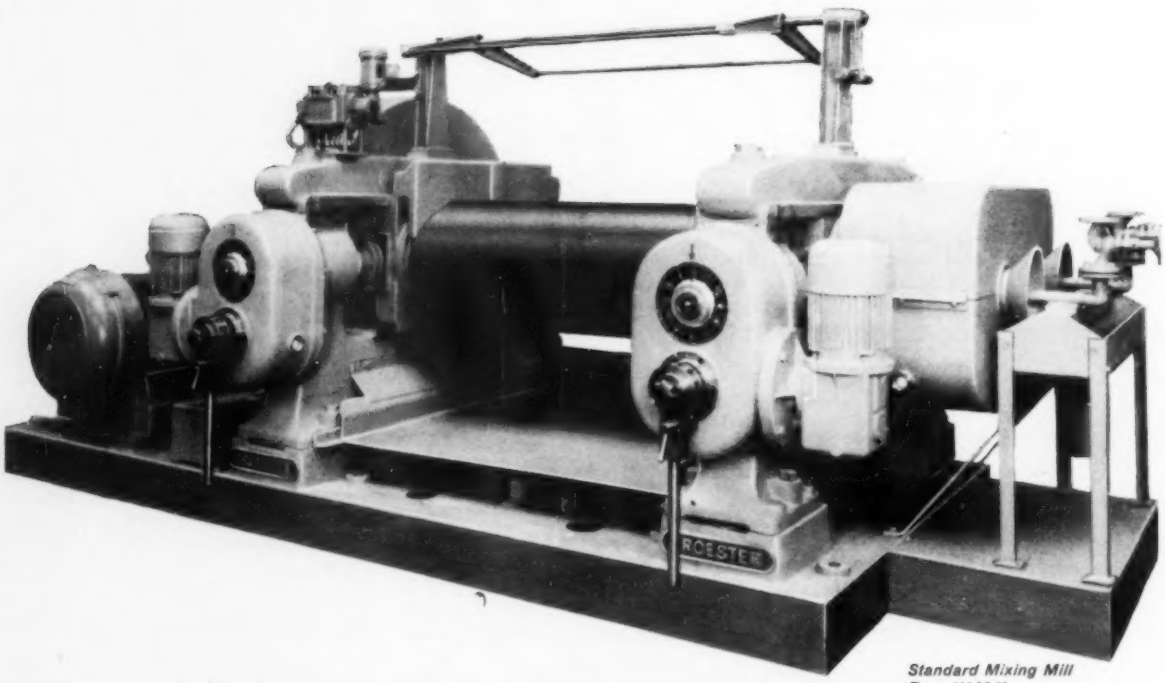
For further information on SP rubber and PA 80 write to:

The Natural Rubber Producers' Research Association, 56 Tewin Road, Welwyn Garden City, Hertfordshire, England.

Issued by The Natural Rubber Bureau.

PA 80 rubber is produced on far eastern estates under licence from the Rubber Research Institute of Malaya and is marketed in the form of 100 lb. blocks wrapped in polythene and packed in multiwall paper bags for ease of handling and good stacking in warehouse and factory.

HIGH OUTPUT ROLL MILLS BY TROESTER



Standard Mixing Mill Type W.M.X.

STANDARD MIXING MILLS TYPE WMX

The high output Troester Roll Mills are known and respected throughout the world's rubber processing industry. Massively constructed, superbly engineered, Troester Mixing Mills are now made in England under licence. If you would like detailed information of the range, please write to:

BAKER PERKINS Ltd

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Superior Processing Rubber*

UNIQUE AID TO MANUFACTURE

By H. C. BAKER and S. C. STOKES, NRPRA.

SUPERIOR Processing rubbers are speciality rubbers which are seen to greatest advantage in extrusion processes because of the following features: (i) low die swell, less affected by extrusion conditions; (ii) higher stock viscosities, permitting easier handling, greater resistance to collapse, better open steam characteristics, *i.e.* resistance to watermarking; and (iii) a wider range of extrusion temperatures and scroll speeds for smooth extrusion, leading to increased productivity. Particular advantage is found in extrusion compounds not too heavily loaded with fillers. Indeed, the essence of an SP rubber is that, from a processing point of view, a pure gum compound behaves as though it is already loaded with filler. As fillers are added the difference between SP and ordinary rubber lessens, the five-fold increase in throughput obtained by using SP with pure gum stocks diminishes as filler loading is increased: at a loading of 80% volume there is no increase. The difference in die swell decreases with increased loading, but SP nevertheless gives an improvement at all loading levels.

A survey of the usage of SP rubbers in Great Britain shows that about 75% of the consumption is for extruded goods or in extrusion processes for stock preparation. A list of applications and reasons for the use of SP rubber is given in Table 1.

Text of a paper delivered at the Rubber Research Conference in Kuala Lumpur.

Development in Malaya

Drake and Sekhar (1958) described the preparation of an SP masterbatch which could be used to impart SP properties to any desired base rubber. Thus, in the East, a masterbatch containing 80% of vulcanized particles admixed with 20% of ordinary rubber can be used to prepare SP brown crepe by blending the wet masterbatch coagulum with scrap rubber on crepeing mills. SP brown crepe is of value because it makes SP qualities available to users of the lower grades of crepe and sheet. Its utility is limited, however, by the fact that the lower grades are often used as blends of more than one grade, and to obtain the full benefits of superior processing behaviour SP brown crepe requires to be used as the sole elastomer in the compound.

The next step therefore, was the development of an SP masterbatch to be used by the factory compounder to blend in any desired amount with any base rubber, and an SP concentrate containing 90% of cross-linked and 10% unvulcanized rubber was prepared for this purpose. Difficulties in dispersing this material in other rubbers were encountered, however, and these led to experiments with SP masterbatches modified to give easier blending.

Recently the composition of dry, concentrated SP masterbatch for export from Malaya has been standardized at 80 parts cross-linked to 20 parts normal rubber, and this masterbatch is now in commercial production under the name of PA 80.

PA 80 in Natural Rubber

Laboratory and larger scale trials have confirmed that the processing advantages offered by SP rubbers have been matched by a blend of PA 80 and first quality sheet or crepe in the ratio of 1 to 3. PA 80 is especially valuable when a still greater degree of processing control is required, for it was shown that increasing amounts of PA 80 in an extrusion compound based on RSS gave increased output by weight of tubing of lower die swell, without loss of physical properties. Similar results were obtained with the lower grades of sheet and crepe.

In many compounds the use of SP rubber allows the use of higher scroll speeds while still maintaining good surface finish. For example, throughput rates were obtained for RSS and RSS/PA 80 (3/1 ratio) in a tyre tread compound, the increase in output of over 25% in the latter mixture being obtained by the higher scroll speed which was then possible.

An example of the excellent physical properties combined with superior processing which is obtainable with high proportions of PA 80 is shown by the data for a compound containing 40 parts of activated whiting. Under the fixed conditions of extrusion in the laboratory, this compound gives tubing with a rough surface when based on ordinary RSS. This defect can be eliminated with no loss in physical properties by the substitution of half the rubber by PA 80; indeed, tear strength is enhanced and tensile strength and breaking elongation after ageing are increased.

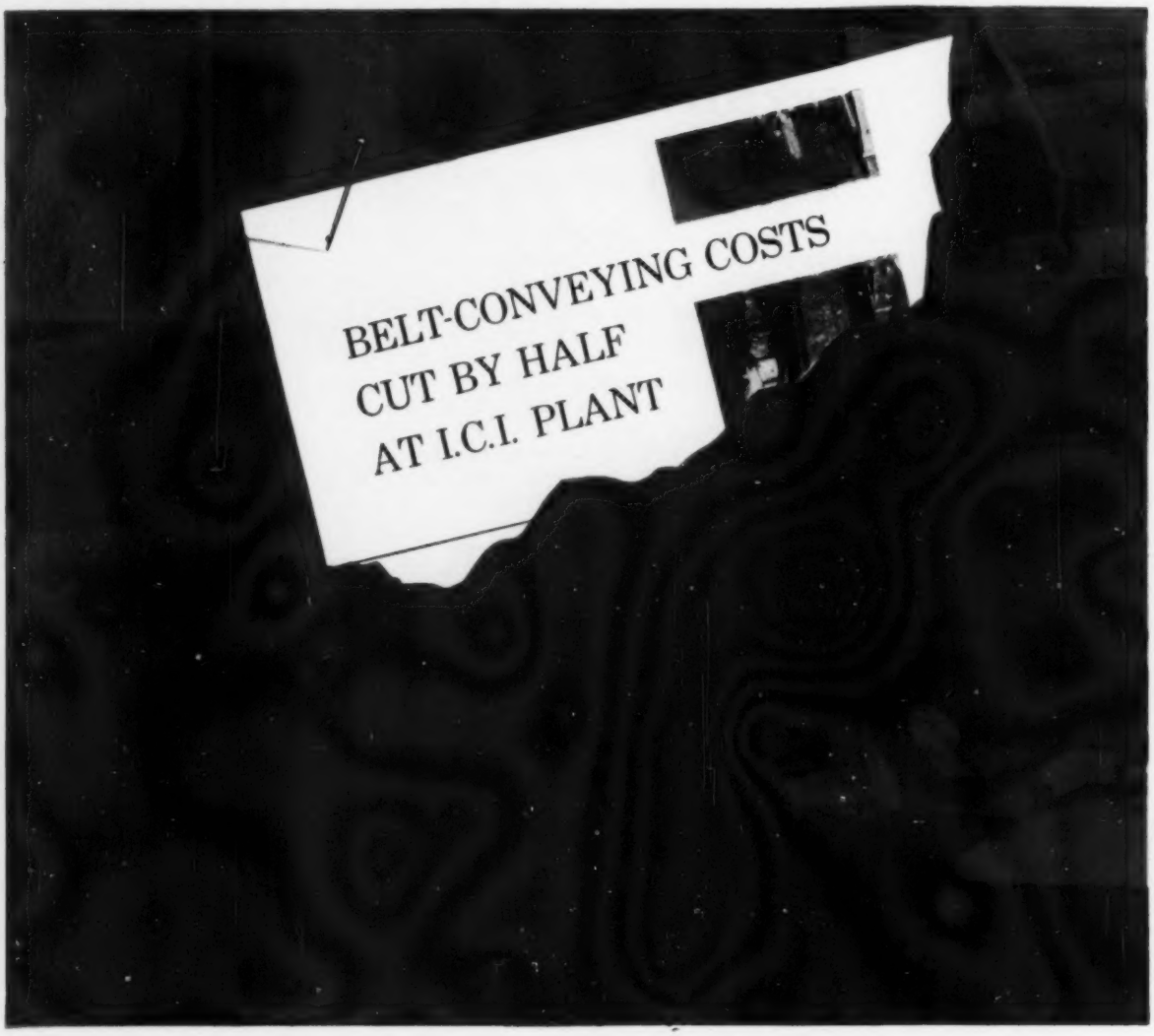
In order to compare PA 80 with other processing aids, a study was made of the behaviour of natural rubber compounds containing increasing proportions of PA 80, cross-linked SBR 1009, factice and mineral rubber. The two most effective

Continued on page 812

TABLE 1

COMMERCIAL APPLICATIONS WHERE SP RUBBERS ARE USED

Field of application	*Reasons for use of SP rubbers*
Tubing	Improved surface, reduced collapse and less watermarking during open steam vulcanization
Hose	Reduced collapse and less watermarking
Gaskets (*e.g.* refrigerators)	Shape retention with more accurately controlled section size
Door sealings	Improved shape retention
Extruded sponge (*e.g.* car door sealing strip)	Better dimensional control of extruded sections
Surgicals	Permits better-quality compounds to be used while maintaining the requisite good extrusion properties
Extruded stock for moulded mechanicals	Better dimensional control of blanked units
Calendered sheet	Better surface finish, easier handling, reduced shrinkage before and during cure for hand-built goods; better processing permits upgrading of quality
Moulded goods	Higher stock viscosity minimises air trapping in intricate moulds
Very soft compounds	Reduced cold flow in storage and easier handling on account of higher stock viscosity
Solvent cements	Permits higher concentration of solids



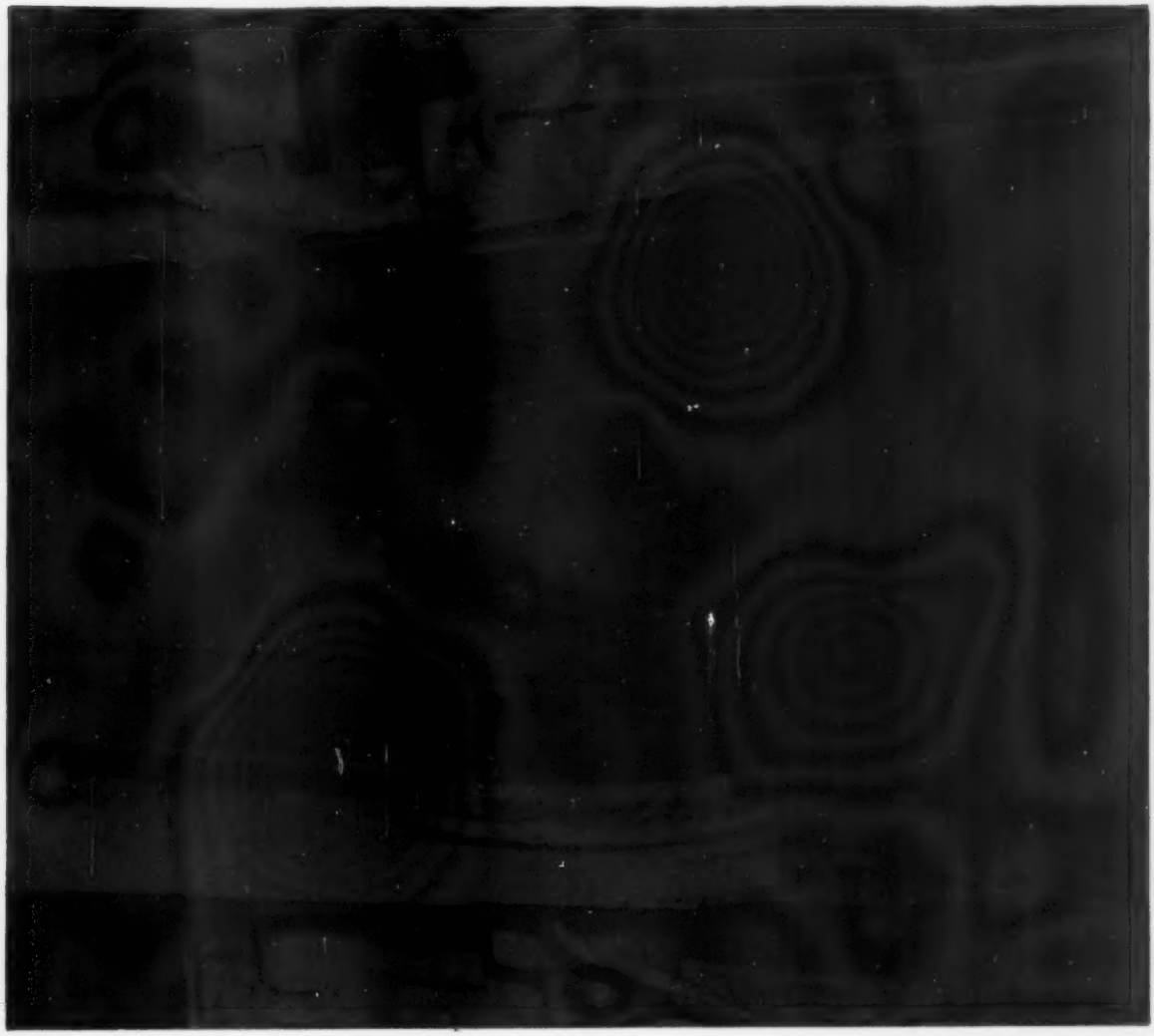
Costs cut–

By installing a Butyl Rubber-covered conveyor belt at their Billingham Chemicals Plant, Imperial Chemical Industries cut the cost of belt-conveying phosphate fertilizer by half.

WORKING life quadrupled

Because of the heat of the fertilizer (about 115 degrees centigrade), its corrosive properties, and the usual damage from moisture and ageing, even the best synthetic rubber belts used previously have worn out in a year, after shifting about 132,000 tons. The Butyl Rubber belt was installed four years ago and has shifted 650,000 tons.

ESSO MEANS BUSINESS IN CHEMICALS



COST still going down

As the Butyl Rubber belt is still in perfect condition, and I.C.I. expect it to work indefinitely, belt-conveying costs will probably fall still further.

When ordering conveyor belting, it will pay you to specify

ESSO BUTYL

Esso Butyl is the man-made rubber with the longest flex life and the greatest resistance to heat, corrosion, ageing, ozone, moisture and tearing. (For handling especially hot materials, Esso Butyl covered belting is even more efficient on a 'Terylene' base.)

Esso CHEMICALS

For information about Esso Butyl Rubber, telephone: HYDe Park 7030, or write to Esso Petroleum Company, Limited, Chemicals Department, 50 Stratton Street, London W1

ESSO MEANS BUSINESS IN CHEMICALS

VIEWS *and* REVIEWS

ONE of the functions of 'Views and Reviews' is to draw your attention to new products, developments, ideas as reported in the very extensive literature of our industry. An entirely new, high-polymer product with a new technology and new approach has been born, nurtured, and grown almost to maturity while many of us were not looking, so to speak. It is the use of high-polymers in rockets.

Rubber to Burn

It was not to be supposed that our industry was likely to remain unaffected by the tremendously intensive and extensive work being carried out at public and private expense on engines and vehicles for travel in space. It is not merely that we are asked to provide a very large gasket, for example, or a new paint or even a rubber that will remain elastomeric at high and low temperatures. We are asked to visualize our materials and products functioning in an entirely new environment — at temperatures over 3,000°F. and pressures above 100 atmospheres. But, you say, they will burn. Precisely. The problem is how to make them burn quickly enough and uniformly.

A group of papers in 'I/EC' Vol. 52, No. 9, September 1960, is of considerable interest to polymer technologists and deals with these extreme conditions and the polymers which are required to meet them. In designing the propellant after the vehicle, it provides another illustration of the modern tendency to put the cart before the horse.

I must say that I found the seven papers heavy going, partly because of my own shortcomings and lack of technical equipment for following some of the mathematics, partly to the obscurities in the writing in places, but mainly because I wanted a map so that I, a stranger, could find my way about the area. It seemed to be assumed that the readers had a prior knowledge of the constructional details and principles of rockets. This does surprise me for I have always found 'I/EC' so exceptionally good in this way of providing a background that 'new readers can begin here' and get the point easily.

Having now read the seven papers, I have sorted out some of the leading concepts. They all deal in some way or other with the propellant fuels used in rockets. The basis of these fuels is an organic material which is caused to burn with great rapidity inside a suitable casing. To ensure sufficiently rapid burning without actually exploding, oxidizers are blended into the combustible material in suitable proportions.

Clarifying the Picture

For the successful firing of a solid-fuel, rocket motor 'there must be no ignition delay, and the ignited propellant must not blow up nor throw sudden shock loads on the vehicle structure. . . .' begins the first of the seven papers, 'Chemical Principles of Solid Propellants' by E. Mishuck and L. T. Carleton. In such a place I would have expected prior considerations, such as finding a system which has enough energy to do the job at all, or why it must be a solid fuel.

The second paper, 'Plastics as Heat Insulators in Rocket Motors' by W. C. Hourt, begins: 'In its simplest form, a rocket motor is a vessel where reactions occur at temperatures of several thousands of degrees and pressures sometimes exceeding 100 atm.' This is getting nearer to the start of things for the inquiring reader but, naturally, the author then plunges straight into his own bit of the complex.

The third paper deals exclusively with the nozzles of rocket motors. This is out of place in the series and adds to the confusion. (Authors should learn that they have to write for dolts like me who do not even know that rocket motors have nozzles.)

Paper number four is entitled 'Formulations and Quality Control in Polyurethane Propellants,' by H. E. Marsh, Jun., and it confines itself well to that topic. It does sketch a bit of helpful background, thus: 'The present competitive position of solid propellants was generated in the middle 1940s when elastomeric composite propellants were introduced. For the first time, lightweight hardware was made possible by using case-bonded propellants to protect motor chambers from the high combustion temperature. . . . Composite solid propellants consist of two major components, a crystalline inorganic oxidizing agent and a polymerizable liquid rubber. The rubber serves both as binder and fuel. Normally, the stoichiometry of combustion is such that the system is highly filled with the solid oxidizer. Solid and soluble additives are employed for various purposes; typical composite solid-propellant additives include ballistic modifiers, surface active agents, plasticizers, and polymerization catalysts. In this article, composition of polyurethane rubber in the highly-filled system is under study, not effects of solids loading and additives.'

The picture is beginning to get much clearer now — but what a laborious journey through several misleading stages.

The fifth paper is again a specialized one and, although of great interest to the polymer technologist — I outline it later — it does nothing at this stage but distract from getting a general background.

Castable Propellants

'Elastomeric-Binder and Mechanical-Property Requirements for Solid Propellants' by T. L. Smith, is the sixth paper in the group and one of the most informative in both a general and specialized way. It begins: 'The current interest in solid propellants for large, high-performance rocket motors stems largely from the development of castable composite propellants that can be case-bonded in thin-walled motor cases. Such propellants are prepared by first dispersing a solid oxidizer and other solid additives in a polymerizable liquid fuel. (Typical oxidizers are potassium perchlorate, ammonium perchlorate, lithium perchlorate, ammonium nitrate, and ammonium picrate.) Prior to incorporation in the liquid fuel, the oxidizer is frequently ground to give the desired particle size: several grinds may be mixed to give a desired particle-size distribution which influences castability of the propellant mix as well as burning rate and mechanical properties of the cured propellant.'

(The very specialized question of grinding and mixing

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **F. C. JENNINGS**

the ingredients of the thick slurry is dealt with in the seventh paper.)

'After the oxidizer and other additives are uniformly dispersed in the liquid fuel, the thick dispersion or paste is cast into a metal motor case around a centred mandrel which has been inserted to give the desired shape to the dispersion. The dispersion is then cured at a moderate temperature to produce a rubberlike propellant bonded to the motor case. A single piece of solid propellant is usually called a grain, even though it may weigh several thousand pounds. After cure, the mandrel is removed, leaving an internal perforation or configuration in the grain. When such a case-bonded grain is ignited, the grain burns only on its interior surface. During burning, the unburned portion of the grain insulates the motor case from the extremely hot flame.'

I regard that as a first-class introduction to the whole group of papers, and the author continues for some time in the same way, proceeding in a logical manner which can be easily followed from the general to the particular. Had this been the first paper or had this part of it been placed at the beginning as an introduction it would have saved me, and therefore, I suppose, others, much time and trouble finding our bearings and may even have caused some to read the symposium who gave it up as too much trouble.

Properties of Charges

Now that I have had my grouse, let me turn to the otherwise admirable symposium and pick out some of the undoubted points of interest and value to the polymer technologist.

T. L. Smith on p. 776 explains that, in addition to the polymerized-in-place, bonded-to-the-case 'grain' of propellant fuel consisting of rubber plus oxidizer, there is the cartridge type which is more-or-less loosely supported inside the case. Cartridges are made by extruding the shape required from a rubber-oxidizer compound prepared on a mill or in a mixer.

If a propellant is bonded to the case (which usually gives a higher overall performance) it must have relatively high ultimate elongation but can have, and usually does have, a relatively low modulus and tensile strength. 'On the other hand, cartridge grains need not have a high ultimate elongation since they are not bonded to the case, but they must have a high modulus and tensile strength. Such properties are needed to prevent appreciable deformations of the grain under the pressure gradients produced in the rocket motor by ignition and burning of the grain and by flight acceleration forces.'

The author considers in some detail the mechanical properties required in a case-bonded grain and then its ballistic properties coming in this way to an ideal specification. 'The ideal binder should have a low glass temperature, should exhibit high elongation over a wide temperature range, should be cross-linked preferably through stable primary valence bonds, and should not crystallize spontaneously during storage at any temperature. The uncured binder material should be a liquid which cures with minimum heat release and shrinkage and without evolution of gases. The binder should dissolve little or no oxidizer and should be chemically stable for long periods in close contact with the oxidizer. Other factors to be considered in weighing the relative merits of potential binders are oxygen balances, viscosity prior to cure, and density.'

Oxygen Ratios and Particle Adhesion

This is a paper so clearly written and logically arranged that it is tempting to spend more time quoting from it. For instance, there are discussions interesting to chemists on oxygen ratios, and to physicists on particle adhesion, and to both on fillers and glass temperature. A chart shows that there is a complex relationship between the internal configuration of the 'grain' of propellant and the shape of the time-thrust it puts forth.

W. C. Hourt's paper on p. 761 puts another point of view — the value of plastics propellants as insulators. Few constructional materials can withstand the high temperatures, pressures, gas stream velocities and chemical reactivity of the products of combustion. The key to the problem appears to be to develop a fuel which leaves a char residue strong enough to resist erosion by gas-flow ('ablation'), porous enough to permit the passage of the products of combustion, and amorphous to ensure minimum heat conductivity.

The paper by Mishuck and Carleton on p. 755 explains how the manufacture and use of solid propellants is controlled by their thermochemistry, including kinds and rates of burning, rheology, polymerization, mechanical properties, and ageing. After a consideration of these requirements, the authors conclude that 'Representative propellant binders include unsaturated polyesters cross-linked with styrene or other vinyl monomers, as well as cross-linked, long-chain polysulphides and polyurethanes formed by the condensation of long-chain diols, diisocyanates and polyfunctional cross-linking agents.'

The Polyurethanes

From here, the story of elastomeric binders is taken up by H. E. Marsh, Jun., on p. 768, writing under the title 'Formulations and Quality Control in Polyurethane Propellants' and carried somewhat further by Murbach and Adicoff on 'Linear Polyurethanes from Polyalkalene Ether Glycols,' on p. 772.

Marsh derives parameters important in characterizing the three-dimensional network of the polyurethane system. He points out but cannot explain the generally recognized need to use about 5% isocyanate more than the stoichiometric proportion. He also suggests a useful characteristic which he calls tensile capacity and shows a plotting of the tensile data which distinguishes families of materials.

Murbach and Adicoff's paper deals with a method of overcoming the shortcomings of the conventional polypropylene glycol reaction products with diisocyanates, chain-stopping due to terminal unsaturation and the secondary hydroxyl groups giving different rates of reaction and therefore non-ideal three-dimensional networks. They made a diol by copolymerizing ethylene oxide and tetrahydrofuran, and, reacting it with MDI, compared the properties of the polyurethane with a similar one made from Terracol 30. They also find the need for the 5% excess isocyanate and advance several reasons of which dimerization is the most likely.

Whatever the binder used it is important that the mixing into it of the oxidizer be very uniform. The last paper in the group deals with this question under the title 'Radioactive Tracer Techniques in Solid Propellant Mixing' by A. M. Hoffman.

CHARLES JENNINGS

SUPERIOR PROCESSING RUBBER

Continued from page 807

materials in this compound are PA 80 and dark factice, in this order, and maximum assistance is given by 60 parts of PA 80 and 40 parts of dark factice. Although at 40 parts addition the processing and open steam vulcanization behaviour of PA 80 and dark factice are not dissimilar, the vulcanizate characteristics markedly favour PA 80. Thus PA 80 confers substantially better properties, although at greater cost. When, however, a compound containing 40 parts factice is designed to give equivalent tensile properties to those of a compound containing 40 parts PA 80 and 75 parts whiting, the costs are similar; the performances of the two compounds are well matched in most respects, but compression set of the compound containing factice remains inferior.

Blending With NR and SBR

PA 80 generally blends readily with other rubbers on open mills. Both materials are added together at the commencement of mixing, banded, and mixing carried out in the normal way. In internal mixers, however, some special precautions may be necessary, and in factory machines some manufacturers have experienced difficulty in blending PA 80 with ordinary rubber when preparing a compound.

This trouble has been attributed to using a premasticated rubber, and has often been overcome by adding the PA 80 with unmilled rubber at the commencement of the compounding cycle. It is necessary, however, that care should be taken with the blending process, and with compounds containing little or no filler loading it may be advisable to give the PA 80 a preliminary warm up in the first minute of the mixing cycle prior to adding the other rubber. Blending of PA 80 with natural rubbers therefore presents little or no difficulty, but with SBR, and particularly oil-extended SBR, the problem can be more serious. Highly loaded stocks can be prepared without difficulty due to the high shearing action promoted by the presence of the filler, but, to ensure perfect blending with stocks containing low filler content, it is recommended that PA 80 be given a short milling period, sufficient to smooth out the crumb-like nature of the material, prior to blending with SBR. With soft fillers, normal mixing cycles may be employed, but with reinforcing fillers, particularly those used in tyre tread type compounds, it is necessary to extend the mixing cycle. If, however, the PA 80 is premilled to a viscosity of around 50 Mooney prior to blending, then compounding with reinforcing fillers presents no difficulty and mixing cycles are of a similar duration to those where no PA 80 is used.

SBR Extrusions

The above observations are based on work carried out on laboratory and larger scale equipment, which also shows that extrusion compounds based on SBR/PA 80 blends have the lower die swell and improved open steam characteristics associated with RSS/PA 80 blend compounds when compared with similar compounds based on SBR only. They have better surface finishes in most cases and the uncured stock can be stored and handled more easily with less tendency to distortion. Except in the presence of large volumes of fillers, the physical properties of the vulcanizates are in no way impaired and, in some compounds containing non-reinforcing fillers, are improved.

Except with some moderately loaded stocks containing soft fillers, extrusion throughput is not increased by the use of PA 80 in SBR, and in some cases (as with reinforcing fillers) there is a slight decrease, although this latter disadvantage is overcome when the PA 80 is premilled before blending with the SBR.

(To be continued)

Plastteknik 1960

COMMERCIAL AND TECHNICAL MEETING IN STOCKHOLM

A PLASTICS conference is to take place in Stockholm from November 21-24 under the auspices of Svenska Plastföreningen (The Swedish Plastics Federation). The first day is to be devoted to the commercial aspects of the integration of the European market and its influence on the future development of the plastics industry in Western Europe. Speakers on this subject will include A. Renfrew, director of I.C.I. Plastics Division and chairman of the overseas trade committee of the British Plastics Federation, and D. Radford, director and general manager, Ekco Plastics Ltd., chairman of the British Plastics Federation, and the main lectures will be followed by a discussion between representatives of several plastics industry organizations in Western Europe.

During the remaining three days there will be three concurrent sessions of lectures on a wide variety of subjects dealing with the processing, applications and properties of thermoplastic and thermosetting materials and reinforced epoxys and polyesters. Application forms for participation may be obtained from Svenska Plastföreningen, Karlavägen 43, Stockholm.

Birfield Ltd. have moved to 20 Hill Street, London, W.1. The telephone number is still GROsvenor 7090.

Blast Tests PVC Leathercloth

WHEN the French ammunition ship *La Coubre* exploded in Havana, Cuba, a number of 'Olympic' coaches nearby on the quayside were severely damaged. Nine of these were shipped back to Britain for repair.

Assessors studying the damage saw that blast, burning debris and falling masonry had shattered the windows, buckled the doors and breached the coachwork. But the PVC leathercloth used as upholstery fabric for the seating had come through almost unscathed — apart from a few punctures and some charring.

In fact the Melloroid fabric — a low flammability upholstery material made with Geon PVC — had acted as a fire blanket. When cushioning material had been gutted, the leathercloth had been charred but remained largely intact.

A spokesman for the exporting company claimed: 'After a quick dust over, most of the Melloroid leathercloth was as good as new.'

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MEN and MATTERS

A Review of People and Events

by Peter Richards

I HAVE just been reading a sobering little news sheet in the 'Terylene in Industry' series. This is about car safety belts and if it doesn't make you want to fit belts into your car nothing ever will. It achieves this effect without using any pushing 'advertising language.'

'When a violent impact occurs, the car becomes buckled and deformed in a way that is likely to release the doors and may result in passengers and driver being flung out of the car. If this happens, risk of death is generally very high. If they remain inside the car the occupants are thrown forwards, or upwards and forwards, from a seated position, so as to strike the steering wheel, windscreen, tray or locker edge, brake or other handle, roof or window frame.

'The body may also be violently deformed by "whiplash," or rotation upon impact, causing injuries of considerable gravity.'

Diagrams and a number of cases detailing how belts have — or could have — saved lives, make this a valuable contribution to road safety as well as an advertisemeent for Terylene.

Competition Welcomed

Mr G. G. Riddick, chairman of Formica Ltd. and managing director of Formica International Ltd. left earlier this week to visit his associated company in the USA and Formica subsidiaries in Australia and New Zealand. Before he left, Mr Riddick, referring to the entry of further competitors in the field of decorative laminates in the UK, said that Formica welcomed competition.

He went on to say that sales of laminates *per capita* in this country are only slightly over half of those in North America and Australasia; in neither area is anyone any where near saturation point. There is room for newcomers. Who knows — they may open doors through which others will enter.

Horners Award

Only 20 designing days remain before the close of the Horners Award Competition on December 2. This year, the annual award made by the Worshipful Company of Horners to encourage young craftsmen to produce good designs in plastics is worth £105, or, to those to whom it sounds more, 100 guineas. Age limit for this year's competition is 35.

Entries should consist of a perspective sketch; a written description; proposed method of manufacture and a working drawing, with dimensions, of the plastics parts. Entries should be sent to the British Plastics Federation, 47-48 Piccadilly, London, W.1, from whom details and entry forms are available.

Curbing the Cacophony

Car doors slamming, dustbins clattering, machines vibrating, television gun fights exploding through the party wall . . . these are just a few of the noises we have to put up with. Or do we? John Connell, secretary of the Noise Abatement Society, gives a categorical (albeit whispered) no to the question. He was the man who, not so long ago, played a tape recording of the noises of London Airport outside the Minister of Aviation's house early one morning.

One of the leaflets that 'NAS' is distributing will please rubber manufacturers as well as silence addicts. It urges members to buy dustbins with rubber lids and feet, or to persuade their local authorities to do so.

Rich as Leather

I have just been handling a new type of PVC sheet from America which is as soft, resilient and 'rich feeling' as calf leather. It consists of a layer of a vinyl foam on a knitted cotton base (75% cast vinyl and 25% cotton; my sample is about 40 thou.). The outer surface of the foam has been treated to give a sheet finish which can be embossed to leathercloth texture.

When this product gets going, it should oust nappa grades of vinyl from a good many applications. Handbags and upholstery are obvious outlets and, since it is ready lined and therefore to a certain extent absorbent, it is suitable for gloves and jackets, some of which are being introduced on to the UK retail market this week.

I hear that two UK firms have been working round the clock on

A. W. F. Chatfield, of North British Rubber, who has been chairman of the technical committee of the Rubber and Plastics Footwear Manufacturers' Association since it was formed in 1940, received gifts from fellow members at a luncheon in Manchester on November 3 marking his retirement. My picture shows the chairman of the association, A. D. McDiarmid (*right*), presenting Mr Chatfield with an Edinburgh crystal bowl. From the technical committee he received a china coffee percolator, presented by J. F. Sarginson, of Pirelli, the new chairman of the technical committee

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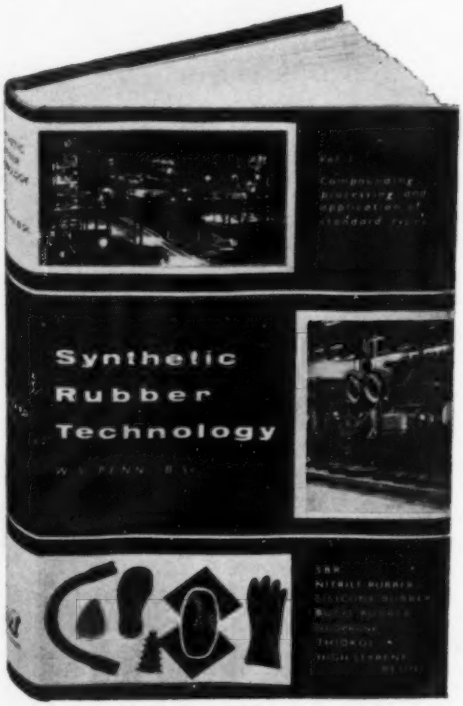

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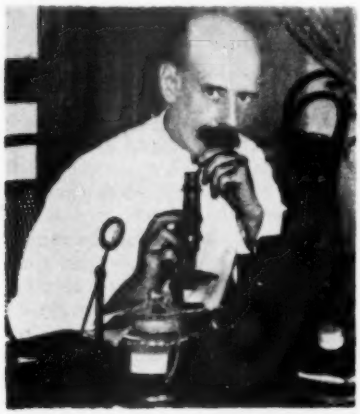
this product. One was about to bring trial amounts on to the market a few weeks ago, but ran into technical difficulties.

Johnny Appleseed

This sinister-looking gentleman is not an anarchist or a villain of the silent films, but Henry Nicholas Ridley (1855-1956), naturalist, botanist, geologist, explorer, and



author, who will be installed in the University of Akron's international rubber science hall of fame next Friday November 18.

Ridley, whose 'herring-bone' tapping method made possible the production of natural rubber in large quantities, will be the seventh member of the Hall of Fame, and the third Englishman.

Five individuals, who made memorable contributions to rubber chemistry were initiated into the hall in 1958: Charles Goodyear (American, 1800-1860); C. Greville Williams (English, 1829-1910); Carl O. Weber (German, 1860-1905); Henri Bouasse (French, 1866-1953); and Ivan I. Ostromislensky (Russian, 1880-1939). Thomas Hancock (1786-1865) joined them in 1959.

Ridley, while serving as director of the Straits Settlements gardens and forests in Singapore in the late 1880s, foresaw the possibilities of the plantation system and set about to convince anybody who would listen that the world would soon be rubber hungry and that rubber was a commodity with a future.

He has been called the 'Johnny Appleseed of Malaya' handing out rubber tree seed to just about everyone he met.

Ridley carried on the basic agricultural research that made mass-production of rubber possible. At the time when it was thought that the rubber tree could be tapped only once or twice a year, he developed the famous 'herring-bone' continuous tapping method still in use today, proving that trees could be tapped daily with no ill effects, increasing production at a time when the automobile was just around the corner.

In fact some authorities credit Ridley with singlehandedly moving the motor car age forward by as much as 10 years.

On Her Way . . .
The S.S. 'Oriana' . . .

Formica Ltd. has a special interest in the sailing this week from Barrow-in-Furness to Southampton of the new 40,000-ton passenger liner *Oriana*, biggest and fastest passenger liner to enter service since the *Queen Elizabeth* was launched 20 years ago. The s.s. *Oriana* contains some 40,000 sq. ft. of Formica decorative laminates in many colours and patterns.

* * *

Dr L. R. Ridgway, managing director of the chief manufacturing companies of Phillips Rubber Soles, and K. Long-Brown, managing director of the distributing company, are being appointed joint managing directors. They succeed C. H. Hargrave, who has been a director since 1933, and who retired at the end of last month after 40 years' service.

* * *

British Resin Products Ltd. have appointed Mr John S. Murphy as Press Officer for Styron and Rockite moulding materials, and Cellobond and Epok resins. Mr Murphy was formerly in the Sales Promotion Department of British Cellophane Ltd.

Question Corner — 143

(Second Series)

468. What effect have density and molecular weight on the properties of polythene?

(Answer next week)

Answer to Question Corner — 142

467. In addition to the points previously made last week, further considerations on the extrusion of polythene sheeting are:

The length of the die lands varies with sheet thickness and the thicker the gauge the longer the lands required. However, since die pressure increases with die land length, the lands should not be longer than necessary to ensure high quality sheet.

One of the die jaws is adjustable so as to permit making minor changes in die openings to maintain close control on the gauge. The die opening should be set about 10% wider than the desired thickness of the finished sheet.

The take-off unit may consist of a battery of three rolls, set vertically, highly polished and chromium plated, and a pair of driven, rubber covered haul-off rolls. The plated rolls serve the purpose of cooling, gauge control and for imparting the desired finish to the sheet. The rubber rolls serve for tension control and as a haul-off device. The spacing between the top and middle rolls should be set 5% less than the desired thickness of the sheet, that between the middle and bottom rolls 5% more, and that between the rubber rolls about 5% less than the sheet thickness so as to maintain a uniform pull.

The framework for the haul-off unit should be of rigid construction to ensure relative freedom of vibration. Slight vibration may cause a wavy appearance in the sheet. A variable speed drive should be provided.

(Another question next week)

Polly Ester Says . . .

'Natural gas—Lady Loverley's chatter'

PI Symposium on Extrusion

NEW DEVELOPMENTS DISCUSSED AT LONDON SECTION MEETING

ON Tuesday October 25 the London Section of the Plastics Institute held its second 'pocket' symposium. Last year it organized a meeting on 'Preplasticization in Injection Moulding.' This session the theme was 'Extrusion.' Four speakers presented papers of about 30 minutes' duration and after a break for refreshment the second part of the meeting was given over to questions and discussion.

The audience would no doubt agree the papers were full of interesting material, much of which was new, and this was not surprising in view of the calibre of the speakers. Mr B. H. Maddocks, of Union Carbide in the USA, is widely recognized as a world authority. Mr D. Grant, of Bone Bros., needs no introduction to those working in the field of extrusion, while the reputation of Reifenhauser machines ensured that Mr W. F. Gauhe, an expert on PVC extrusion, would have something useful to say. Dr P. L. Clegg and Dr N. D. Huck, of I.C.I. Plastics Division, who gave the fourth paper, are held in equal esteem by those who have had experience in the field.

In the following we give a summary of the individual papers.

Valved and Vented Extrusion

By D. Grant

The use of throttle valves and vents in extruders represents two aspects of recent developments in extrusion machinery.

Throttle valves are not newcomers in extrusion but their use has not always been recognized as such. For example the arrangement in the crosshead die for wire covering constitutes one such. Another common example is the valve in the die used in sheet extrusion of polystyrene, while a newer application is the case where two or more dies are fitted to one extruder. This arrangement is becoming quite popular in polythene tubular film manufacture

These valves not only regulate the flow of the melt to the die, they also improve the quality of the extrudate by supplementing the work of the screw. The design of the latter is, of course, of the first importance but since it is fixed in its characteristics and thus ideally suitable for only one situation, the valve makes for greater flexibility in the use of the machine. It does this by regulating pressure build up and the degree of mechanical working on the screw and in this way improves the homogeneity of the product. Mr Grant illustrated this point with some photographs showing the degree of dispersion of carbon black obtained in various conditions.

The homogeneity of the melt is also of the first importance in film and monofilament production, where the use of a valve can be of assistance.

The speaker went on to discuss the design of valves, which involves the maximum streamlining to avoid any hold-up.

Turning to a consideration of vented extruders, Mr Grant pointed out that their purpose was to eliminate the need for predrying. The volatiles are removed by a sudden release of compression to which the plastic melt is subjected by the screw and this is done by having, in effect, two screws in series. The polymer is passed from the discharge section of the first one to the compression section of the second. Since the depth of the thread in the compression length is considerably deeper than in the preceding section, pressure is released, frothing occurs and the turning screws breaks up the froth thus enabling the steam to get away. The volatiles can be conducted away via a hollow centre of the screw or alternatively through a vent in the barrel.

Such vented extruders have been available for some time but they have often presented difficulties in operation. Mr Grant suggested that the crux of the successful working of such an arrangement is the balancing of the output of the two screws in series, and he then described a new system that he and his colleagues have developed.

It depends on the use of throttle valves at the end of each of the screws. By adjustment of these valves and an ingenious by-pass arrangement in the region of the vent the melt is transferred from one screw to the other in a controlled manner and the disconcerting appearance of polymer through the vent is avoided.

The Effect of Extrusion Variables on the Fundamental Properties of Tubular Film

By Dr P. L. Clegg and Dr N. D. Huck

This paper presented much new information on the relationships between extrusion conditions and film clarity on the one hand and impact strength on the other. It was itself part of a bigger work which aimed at elucidating the conditions which governed the optical and mechanical properties of tubular polythene film.

Dr Huck's first interesting assertion was to the effect that the optical properties of the film can be explained almost entirely in terms of surface structure. Whereas in a thick moulded section internal scattering at crystallite and spherulite boundaries accounts for most of the haze, in thin film, *e.g.* two thou. thick, this factor is not significant. Just as in frosted glass, the greater part of the light is scattered by the surface irregularities.

Such irregularities arise from buckling as a result of aggregation of crystallites and spherulites near the surface, and are quite small. Two other types come from the elasticity of the polythene melt and the speaker referred to them as 'extrusion defects.' In particular 'orange peel' and 'extrusion haze.' These 'defects' produce most of the haze.

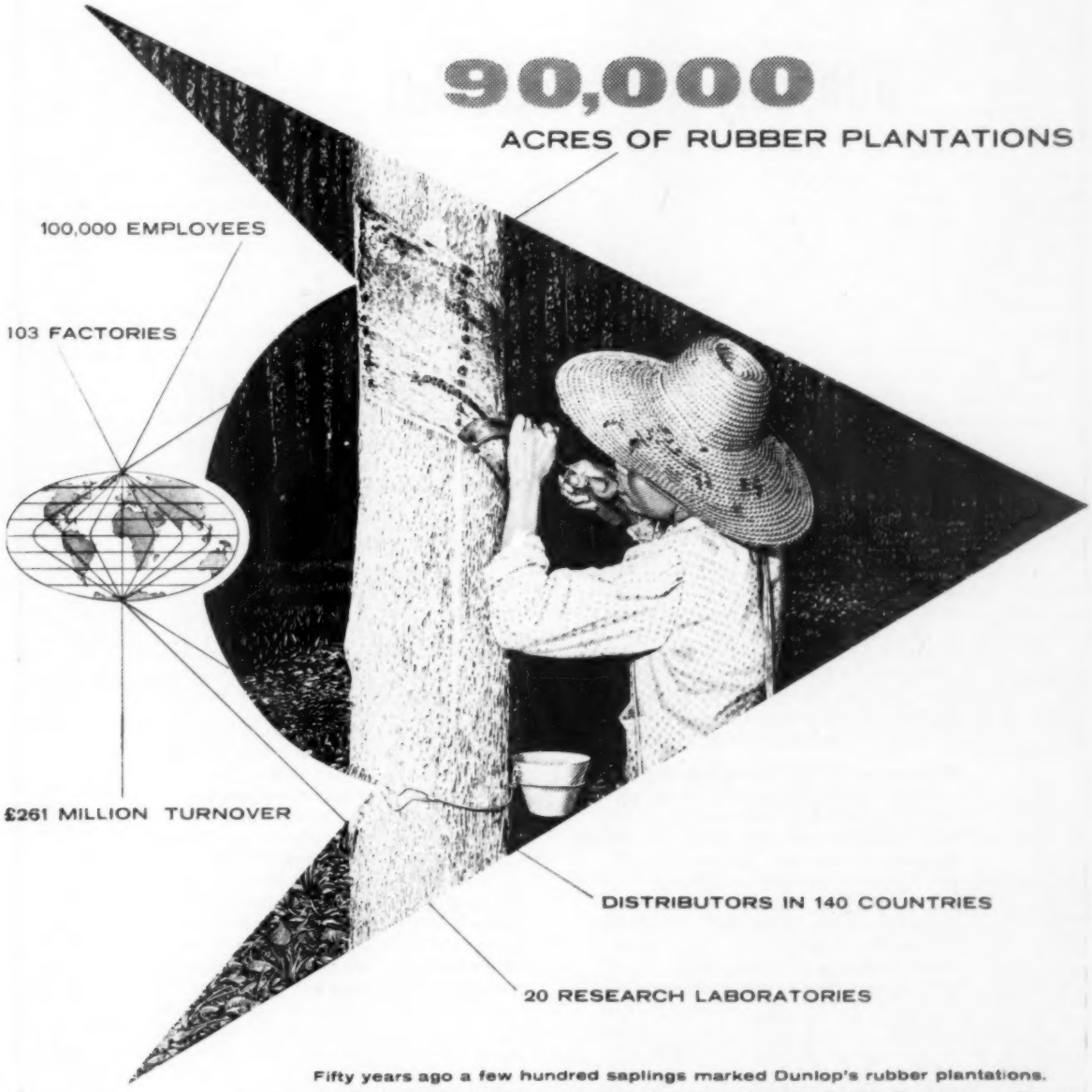
The relationship between these phenomena and specific conditions was then examined. For example, it was shown that there is a dependence on the 'freeze-line distance' *i.e.* the distance between the face of the die and the point at which the film solidifies. It is not a straight line dependence but no less definite for that.

Other extrusion conditions are equally relevant though they are aspects of a more closely integrated pattern. Thus changes in output rate, melt temperature and blow ratio all have repercussions on one another and cannot be considered in isolation.

Higher output rate increases the haze with a constant freeze line distance but variation of the haze in an upward or downward direction depends on the other factors too, as well as on the characteristics of the polythene itself. It depends ultimately

Continued on page 821

BEHIND THE DUNLOP SYMBOL



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PI SYMPOSIUM ON EXTRUSION

Continued from page 818

on crystallization behaviour and the smoothness of the melt. Using these concepts the authors explained the fact that cast polymers are generally clearer even with high density polymers.

The effect of the throttle and the design of the die also appear to make their contribution to the nature of the final product and the paper was at pains to show how.

Dr Huck then turned to the effect of the variables mentioned on the mechanical properties of the film. Of a study of the impact strength, tear strength and elongation at break, he chose to speak of the first.

Mechanical strength is affected by molecular orientation which is in turn influenced by extrusion conditions. Thus impact strength is increased with rising blow ratio (*i.e.* diameter of bubble to die annulus). Further, for a given blow ratio, impact strength increases with output rate.

The Sheet Extrusion of Unplasticized PVC

By W. F. Gauhe

The processing of unplasticized PVC has long proved to be a difficult business. This is mainly the result of the proximity of the processing and decomposing temperatures of the material. Polythene, for example, can be treated between 120° and 340°C. but unplasticized PVC has to be kept between 165° and 195°C. The latter, in addition, is very viscous in the plastic state and does not homogenize readily.

These are some of the problems that must be mastered before wide sheets can be extruded and Mr Gauhe asked whether the results were worth the bother. The answer is a most decided 'Yes,' for on the one hand the properties of the material can be most useful and on the other it is relatively cheap. Sheets produced in this way have been used, in the main, in chemical equipment, large ventilation-shafts and so on.

There are, of course, other methods of producing unplasticized PVC sheet. Laminating calendered sheet and moulding from powder or pellets give products with a very nice finish but unfortunately the processes are discontinuous and expensive. Extrusion of tube, which is subsequently slit and spread open, is also carried out but this process is restricted by the limitation of the tube diameter. Another difficulty arises from the tendency of the sheet to warp and distort on warming, owing to its 'memory.'

The problem of providing large-sized sheets has been solved with the extrusion of PVC through wide band dies. A good product can thus be obtained but only when the appropriate 'rules and regulations' are followed. They look simple but in reality they are very demanding. In the first place there must be perfect conveyance, plasticization and homogenizing. Then there must be good control of the frictional heat developed in the screw and thirdly the design must preclude any obstruction to flow, which would result in increased dwell time and hence give rise to decomposition of the polymer.

Mr Gauhe described two extruders which, in his experience, performed satisfactorily: a 3½in. extruder, operating at 9-33 rpm with a 38 hp motor and a 4½in. machine with a screw range between 3 and 30 rpm and an 85 hp motor.

In all cases power output must be adequate. The length diameter ratio of the screw should be 20-25:1 and the cylinder should be divided into 4-6 separately controlled heating zones. Air cooling may not be sufficient and may have to be replaced by water or air and water.

The screw itself is difficult to describe since there is no single specification that will do for all cases. Compression ratios of 1:2 and 1:3 have proved suitable for pellets and 1:3 to 1:6 for powdered PVC. In practically all cases the screw is constant pitch, single start, with a metering zone length about five times as long as the diameter. An important point is the need to avoid deeply machined screws, even at the cost of reduced output. The design of the screw tip is critical, since the first signs of polymer decomposition are noted at this point. The speaker described some models in detail.

Breaker plates are not generally necessary, though they are often used

Continued on page 826

PI London Section

MORE THAN 300 AT ANNUAL LUNCHEON

THE membership of the London section of the Plastics Institute had grown to such an extent, said the chairman, Dr F. P. Hiron, at the annual luncheon, that the committee was looking for another hall for the evening meetings. Only 250 could be accommodated at the Wellcome Buildings, and at the last two meetings members had had to be turned away. He added that the present membership of the section was more than 1,500.

About 300 members and guests attended the highly successful luncheon, which was held at the Criterion on November 3.

Among the guests that Dr Hiron welcomed were C. H. Glassey (president of the British Plastics Federation); H. F. Wilson (president of the Plastics Institute); G. N. Welding (chairman of the London Section of the IRI); Dr G. A. Collie (chairman of the plastics and polymer group of the Society of Chemical Industry); and J. Everson-Davis (chairman of the Western section of the PI).

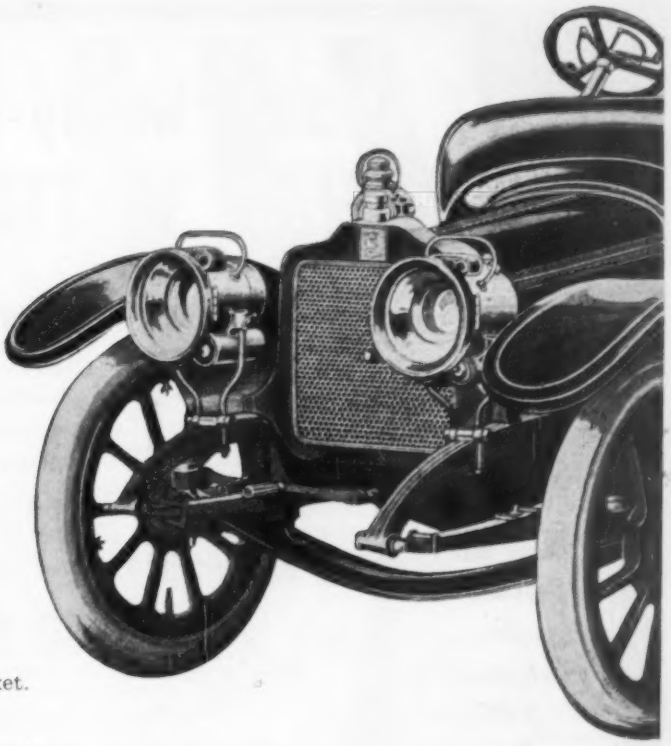
H. F. Wilson presented the silver medal for the best paper printed in the PI transactions to B. S. Dyer (I.C.I.), whose paper was 'Vinyl Chloride Polymers: their Design and Application.' He awarded the Fellowship of the Institute to E. Morris (chief engineer, Greengate and Irwell); Mr Morris is also a Fellow of the IRI. Associateships were presented to A. J. Brown (May and Baker), A. Kennaway (Metal Box) and A. Amigo (Fibrenyle). In the absence of the chairman of the Midland Section, the Midland Section prize was presented by Dr G. Tolley, chairman of the PI council to J. V. Dahinton.

The guest speaker was Dr S. G. Burgess, who talked about his work as chief scientific officer of the LCC.

Some of those at PI London luncheon (*following page, left to right*): **1. Dr S. G. Burgess, Dr F. P. Hiron (chairman, London section) and H. F. Wilson (president of the Institute). 2. Dr W. Dawson, H. I. King and R. G. Heyes (all of I.C.I.). 3. Dr W. H. Bodger (Revertex) and G. N. Welding (chairman of the London section of the IRI). 4. W. G. Sweeney (I.C.I.), H. G. Levack (I.C.I.) and L. H. S. Rivett (A.E.I.). 5. J. D. Hamilton (Richard Klinger), E. J. G. Balley (I.C.I.) and L. W. McCabe (I.C.I.). 6. R. J. Vincent (Fawcett Preston), J. Griffith (Fawcett Preston) and H. M. Whitcut (Du Pont (UK)). 7. E. J. Bee (Standard Telephones) and R. Tervet (Fraser and Glass). 8. Dr Gaspard (PECO) and Dr W. Dawson (I.C.I.). 9. H. R. Harwood, L. W. Rodway and K. F. Crayford (all of BTR). 10. E. M. Hebdon (G. N. Haden), A. E. Wood (Yorkshire Imperial Metal), T. Hollyoak (Yorkshire Imperial Metal) and J. O. Brown. 11. D. Wilson (NRPRA) and G. R. Dyke (Francis Shaw). 12. C. M. Edwards (BX Plastics) and G. Hunt (Halex). 13. Maldwyn Jones (I.C.I.) and E. Morris (Greengate and Irwell)**

Plastics Institute

LONDON SECTION ANNUAL LUNCHEON



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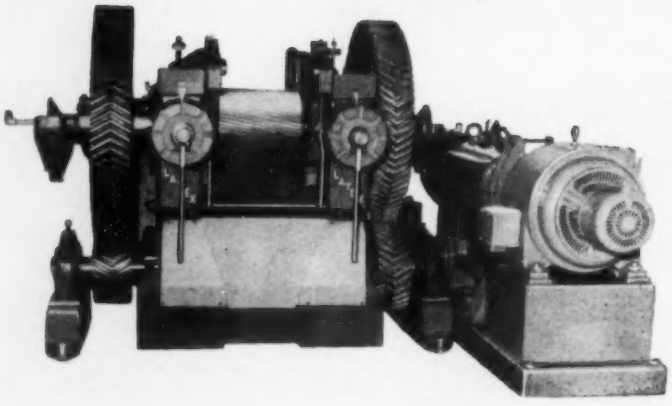

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RMEA Course

SENIOR MANAGEMENT DISCUSSED AT SOUTHPORT

THE second Senior Management Course organized by the Rubber Manufacturing Employers' Association was held at the Prince of Wales Hotel, Southport, from October 24 to 28.

The theme of the course, which was attended by over 30 delegates from member firms, was 'The Art of Management,' and the papers were grouped under six headings: 'Financial,' 'Authority,' 'Personnel,' 'Training,' 'Selling' and 'The Future.' The speakers were drawn from inside and outside the rubber industry. After the papers, the delegates formed themselves into discussion groups and later reported back to the speakers.

The terminal dinner on October 27 was attended by F. I. Tuckwell (Chief Personnel Officer, Dunlop Rubber Co. Ltd., chairman of the RMEA); R. V. Clegg (David Moseley and Sons Ltd., vice-chairman); P. K. Brewin (BTR Industries Ltd., member of RMEA Executive Committee) and A. Babbage (Secretary of the Association). Guests included H. Jackson and W. R. S. Huyton (Leyland and Birmingham Rubber Co. Ltd.), A. Broadbent (Vitafoam Ltd.), G. H. Pearson, J. A. Hardman, I. Keith and G. G. Cole (BTR Industries Ltd.), I. H. Ainsworth (Greengate and Irwell Rubber Co. Ltd.), J. W. H. Hall (Dunlop Rubber Co. Ltd., Speke); G. S. Mallett (Dunlop Sports Co. Ltd., Speke) and F. W. Jones (Dunlop Footwear Ltd., Walton).

The Course was organized by a special sub-committee composed of F. I. Tuckwell, P. K. Brewin, I. H. Ainsworth, R. Edwards (Tyresoles Ltd.) and A. Babbage. G. T. Hulmston, of the RMEA, acted as resident Course Secretary. Courses have previously been held for Senior Management, Departmental Managers and Foremen in various parts of the country.

German Plastics Conference

THE ninth German Plastics Conference, organized by the Arbeitsgemeinscha Deutsche Kunststoffe-Industrie, will take place in Berlin at the Kongresshalle on April 12, 13 and 14 1961.

Preliminary details of lectures in morning plenary sessions are as follows: 'The Plastics Industry in connexion with EEC and EFTA,' by Dr F. Hellwig, Luxembourg. 'The Influence of Pre-treatment on the Properties of Plastics,' by Professor F. H. Muller, Marburg. 'Plastics on the way to Higher Temperature Resistance,' by Dr P. Novak, Kassel, and 'Plastics for Exterior Use in Building,' by Dr G. Blachère, Paris.

In afternoon sessions, delegates will be divided into two groups for short lectures and discussions on subjects such as physical aspects of plastics; manufacturing industrial plastics; reinforced plastics; plastics in the building industry and in packaging; manual work on semi-finished plastics products. On April 12 there will be a reception for foreign visitors and on the following day ADKI hold a dinner in the Hilton Hotel.

Fothergill and Harvey to Re-equip

Fothergill and Harvey Ltd., who specialize in textile constructional reinforcements, announce that plans have now been finalized which will result in complete modernization of existing plant at the company's Littleborough and St. Helens Mills. Acute labour shortage in the area has led the company towards automation and as a result modern high speed preparation machinery is to be installed together with fully automatic filament looms and continuous finishing plant. Extensions to existing buildings are also contemplated.

Among those attending the RMEA Course at Southport: *(back row, left to right)* **C. Crawford (Dunlop), F. Cubbon (Dunlop), G. T. Hulmston (Course Secretary, Rubber Manufacturing Employers' Association), T. G. Mullen (Greengate & Irwell), R. T. Jones (Goodyear), A. J. Smith (John Bull), E. C. Woods (John Bull), E. Shaw (Vitafoam), A. J. Blake (BTR), J. Lyon (Vitafoam), T. Riley (Firestone), P. L. Stiles (Firestone).** *(Middle row, left to right)* **P. Wilkes (Dunlop), H. J. Chard (Dunlop), A. Dunsheath (Greengate & Irwell), A. H. Holt (BTR), J. Hattrell (BTR), A. Nelson (BTR), E. Page (BTR), J. Banks (BTR), C. T. P. Black (BTR), H. Norris (BTR), L. Hodges (Mitcham Rubber), J. Duke (Goodyear), E. Sidgreaves (Leyland & Birmingham), J. A. Hardman (guest, BTR), J. A. Davison (BTR), L. Shaw (Vitafoam), A. Broadbent (guest, Vitafoam), D. W. Brooker (Fleming, Birkby & Goodall).** *(Front row, left to right)* **A. Babbage (Secretary, RMEA), P. K. Brewin (BTR), F. I. Tuckwell (Dunlop), R. V. Clegg (David Moseley), R. Biggs (Vitafoam), J. Buchan (Vitafoam)**

Plantation Commentary

REPLANTING FOR HIGHER YIELDS AND LOWER PRICE

FROM KUALA LUMPUR

THE two rubber conferences held recently in Kuala Lumpur seem to have given added urgency to the Malayan Government's policy of encouraging replanting. Both formally and informally delegates to the International Rubber Study Group meeting and to the Natural Rubber Research Conference emphasized that the future of natural rubber would very largely depend on the price at which it could be produced. They pointed to the rapid strides being made by the synthetic product in meeting natural at every point where the tree-made product seems to have an advantage and while confident enough that the demand for Malayan rubber would continue to be satisfactory, emphasized almost to the point of needless repetition that price would be the factor.

With price, Malaya's answer is in replanting where through the use of trees with a much higher yield (there is talk of the 'yield barrier' being broken and of eventual yields of 3,000lb. an acre or more as against 1,000-plus today) costs can be drastically reduced.

Speaking to the Rubber Replanting Staff Union in Kedah State while the aura of the research conference was still visible, the Minister for Commerce and Industry, Inche Mohd. Khir Johari, referred to the Government's encouragement of replanting and the $280m. scheme launched before independence and said that since the war a third of the total acreage of rubber in Malaya had been replanted.

This, however, was not enough. 'We must do more and we have only a short breathing space to carry out this task,' he told the union, which caters for officials concerned with replanting.

Withdrawal Threat

With unusual directness he referred to a number of estates and smallholdings which did not seem to be aware of the urgent necessity to replant. There was a hard core, he said, of 616 estates, most of them of less than 500 acres, which had not yet taken advantage of the replanting scheme. 'They have until 1962 to do so, but it is becoming increasingly obvious that where inducements fail to produce the desired results it may be necessary to substitute in their place some form of statutory sanctions,' he said. 'In fact, I am wondering whether in such cases it might not be more in the national interest for the titles to these estates to be withdrawn and given instead to those who are willing and able to do replanting.' He added that he had something up his sleeve for these estates if they did not try to replant by the end of this year.

Whether the Government will in fact carry out such a threat concerning estates totalling 160,000 acres remains to be seen. To interfere with land titles might result in the remedy being more troublesome than the illness, but it is an indication of the Government's feelings and of the urgency with which replanting is now regarded. Most of the tardy estates are, according to reports, claimed to be either unable to make a profit or to be property which is being considered for disposal. The Malayan Estate Owners' Association, however, intends to have another go at its members who are showing little interest in replanting, even with the help of Government grants.

Despite the emphasis on estates, they are probably the least of the Minister's replanting worries.

The smallholders are the ones who are seriously behindhand, and Inche Mohd. Khir asked the replanting officials to attempt to instil into the mind of each and 'every smallholder that the next few years are trying ones for our natural rubber industry and that every effort should be made to put our industry on a strong, competitive footing to meet the challenge of synthetic in the years ahead.'

The Minister pointed out that though the rate of replanting had increased to the point where 320,000 acres of smallholders' rubber had been replanted since 1953, this was still not good enough. There were about 1,500,000 acres of smallholding rubber and nearly three-quarters of this was old and uneconomic rubber. (In contrast, about two-thirds of the estate rubber is now being produced by high-yielding trees.)

A lot more hard work would have to be done and there was a need, he said, for leaders to guide the ordinary smallholder through the difficult years ahead. On a critical note, he said: 'They need men who do not think in terms of the prospect of sitting on boards and committees in Kuala Lumpur and drawing handsome allowances, but men of loftier ideals. I am not saying that the present leaders of the rubber smallholders are not sincere, nor am I suggesting that they have not worked for the well-being of the smallholders. But what I would like to see is that as leaders they be in the position of not only being able to lead but also to represent the people on whose behalf they claim to represent.'

The Minister referred specifically to the Council of the Malayan Smallholders' Associations which in the last five years has received assistance from the Government totalling $70,000 and which 'has remained essentially what it was when it was inaugurated in 1956.'

PI SYMPOSIUM ON EXTRUSION

Continued from page 821

to cope with polymers of varying flow properties.

The die-head is basically similar to that used for the extrusion of low viscosity polymers though modifications must be made to deal with the higher viscosity melt. Heating is provided by electrical resistance heaters divided into 5-9 zones and these aim to produce an overall uniform temperature 5-10° higher than the metering section of the barrel.

In these conditions unplasticized PVC sheet between 1/24in. and ⅛in. can be extruded up to about 42in. in width on a 3½in. machine, and about 60in. on a 4½in. or bigger extruder.

Factors Affecting Pressure Development in Extruder Screws

By B. H. Maddocks

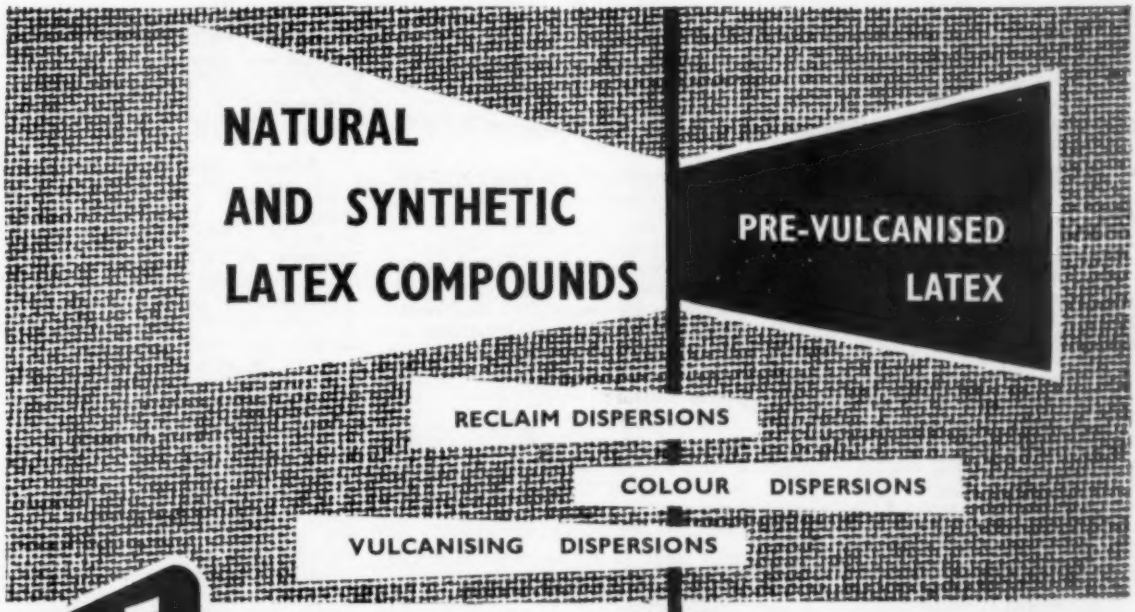
The author presented a closely argued, detailed paper, in which he considered the question of pressure development in the screw. He showed that peak pressures were developed just prior to the entrance to the metering section and resulted in greater output than might be anticipated from the pumping capacity.

He reported on the effect of barrel temperature gradient on the pressure profiles using polystyrene, plasticized and rigid PVC and HD polythene and considered extruder performance in terms of quality as well as output.

It would be impossible in this summary to abstract any more than a bare list of the headings under which Mr Maddocks developed his theme. These were: an examination of the influence of long metering sections and operation at higher screw speeds *i.e.* up to 280 rpm. A number of 2½in. screw designs were examined with variations in the length and depth of the three sections and the conclusion was that there is no universal screw, optimum for a range of materials and operating conditions.

The author considered that his work supported the contention that degree of mixing in a single screw extruder is a function of the shear rate and residence time and any device which increases either of these two factors at a given output rate improves quality or alternatively permits maintenance of a given quality at higher output. He thought that extension of the metering section led to improved mixing.

Mr L. Coltman has been appointed to the Board of Moto Plastics, of Gateshead.



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The ANALYSIS of RUBBER AND RUBBER-LIKE POLYMERS

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R.A.B.R.M. MANUAL No. 3

By WILLIAM C. WAKE
M.Sc., Ph.D.(Lond.), F.R.I.C., F.I.R.I.
HEAD of CHEMISTRY DIVISION
RESEARCH ASSOCIATION of BRITISH RUBBER MANUFACTURERS

THE first modern work devoted solely to this important subject to be published in the English language. In addition to the analysis of natural and synthetic rubbers, the author deals with rubber-like plastics such as Polyethylene, PVC, PVDC, PVA and Urethanes. Also discussed are the identification of compounding ingredients used in the manufacture of rubber and rubber-like polymers.

It will unquestionably become a standard work and is a "must" for all analysts interested in this subject.

CONTENTS:

Extraction Procedures - Qualitative Analysis for Polymer Type - Elemental Analysis of Extracted Polymer - Direct Determination by Functional Group Analysis - Solution and Dissolution Methods - Quantitative Cracking and Distillation Methods - Carbon Black in Rubber - Ashing, Wet and Dry, and the Determination of Trace Metals - Analysis of Extracts and Blooms - Statistical Aspects of Analytical Work.

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Rubber Statistics

FRANCE—THAILAND—MALAYA—SOUTH VIETNAM—CEYLON

THE French Ministry for Industry and Commerce has issued the following rubber statistics for July and August (in tons):

CONSUMPTION

	August	July	June
Natural rubber	3,355	9,010	9,857
Latex	448	1,171	277
Synthetic ..	3,278	7,481	8,518
	7,081	17,662	19,652

ENTRY INTO PLANTS

	August	July	June
Natural rubber	5,578	10,960	9,000
Latex	457	1,316	1,271
Synthetic ..	5,390	7,135	9,274
	11,425	19,411	19,545

STOCKS AT END OF MONTH

	August	July	June
Natural rubber	19,588	17,365	15,416
Latex	1,704	1,695	1,550
Synthetic ..	14,946	12,834	13,180
	36,238	31,894	30,146

Thailand

Thailand exported 14,842,529 kilos of rubber of all grades in August compared with 7,579,213 kilos in July, according to trade estimates.

Destinations included (in kilos):

	August 1960	July 1960	August 1959
United States	4,317,194	2,770,450	8,630,311
Japan	4,627,783	152,109	1,224,621
West Germany	929,300	1,204,239	254,486
Singapore	2,029,395	814,855	2,230,430
Malaya	667,943	315,096	670,326
Czechoslovakia	965,250	508,029	—
Soviet Union	812,851	304,819	—
Hong Kong	23,247	13,041	15,309
UK	362,464	—	57,030

Malaya

Preliminary information has been given of Malaya's ocean shipments for the month of September (*RJIP* Nov. 5, 783). A breakdown of these shipments is:

Ocean shipments to:	Sheet and Crepe	Latex
UK	9,187	2,034
South Africa ..	1,019	81
Canada	2,026	—
India	2,220	8
Australia	1,971	307
Czechoslovakia ..	2,605	46
France	3,427	597
West Germany ..	8,269	1,378
Italy	4,884	688
Netherlands ..	1,718	162
Poland	2,011	—
Spain	1,657	288
Russia	9,390	—
USA	5,482	766
Argentine	2,208	172
Japan	7,154	686
Others	12,193	832
	77,421	8,045

Total sheet and latex 85,466 tons.

The total ocean shipments for the first six months of this year now stand at 798,230 tons.

An official cable to the office of the Trade Commissioner for Singapore in the UK gives preliminary total ocean shipments of rubber for October as 86,281 tons.

South Vietnam

South Vietnam exported 32,188 tons of rubber valued at £8,470,000 during the first seven months of this year, according to the Vietnam Press Agency.

Most of Vietnam's rubber exports went to France, West Germany and Singapore. Other buyers included the United States, Britain, the Netherlands, Italy and Belgium.

Ceylon

Ceylon's rubber production in September amounted to 14.5m. lb., bringing output for the first nine months of 1960 to 152.5m. lb. September output included 7.5m. lb. of latex crepe, 4.3m. lb. of sheet and 2.5m. lb. of scrap crepe.

Exports totalled nearly 9m. lb., bringing the total for the first nine months of the year to 171.3m. lb.

Mr W. J. Piggott

Mr William James Piggott, a former director of Laporte Industries Ltd., died on November 4.

Mr Piggott joined the company in 1907 in the time of its founder Mr Bernard Laporte. He was appointed secretary of B. Laporte Ltd., as the company was then known, in 1922, and a director in 1944. He retired from executive office in 1956, after nearly 50 years of service, during which time, in addition to his duties as secretary, he devoted much time to the commercial affairs of the company. In 1959 he retired from the board of directors. Mr Piggott, who lived all his life in Luton, was aged 67 years. The funeral was on November 8.

Two further patterns — Australian Walnut and Palazzo Marble — have just been added to the Warerite wallboard range, bringing the number of patterns and colours to 18.

Patent Specifications

The following information is prepared from published Patent Specifications by permission of the Controller of H.M. Stationery Office. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, W.C.2, at 3s. 6d. per copy (including postage).

Alkenyl Aromatic Polymers

No. 850,363. Imperial Chemical Industries Ltd. Inventors: H. Brunner and D. J. Walbridge. Application, February 29 1956. Filed, March 6 1957. Published, October 5 1960.

Polymers or copolymers of para- or meta-diisopropenyl benzene are claimed, the copolymers containing at least 5% of one of these monomers. The polymers and copolymers can be used as moulding resins, in coating compositions, in adhesives, in printing inks and in lubricating oils to raise the viscosity index of the oil. Copolymers of para- or meta-diisopropenyl benzene with styrene have higher melting points than homopolymers of styrene. Oil-modified alkyd resins and polymers or copolymers of para- or meta-diisopropenyl benzene are of particular use in coating compositions since the incorporation of the polymer or copolymer increases the chemical and heat resistance of the coating composition without introducing yellowing tendencies. The alkyd may be modified by blending the polymer or copolymer with it or by forming the polymer or copolymer during the preparation of the alkyd.

Vulcanization of Elastomers

No. 851,787. Compagnie Française Thomson-Houston. Application and Filed, March 5 1959. Application in France, April 9 1958. Published, October 19 1960.

Rubber is masticated in air in the usual way but the subsequent mixing in of the ingredients is conducted under vacuum. The compounded stock is thus free from dissolved air and can be vulcanized to a non-porous product without the application of pressure. This is particularly advantageous when the vulcanizate is used for electrical insulation, as occluded gases, even when compressed as by vulcanization under pressure in the normal way, may cause porosity and result in electric discharges and the corona effect. The application of the process to the mixing of a butyl rubber compound is described in an example.

Shorter Abstracts

Prestressed PTFE Tube. 844,895. Resistoflex Corporation. Filed, January 22 1958.—A tube substantially stable indefinitely at room temperature, but adapted by prestressing to alter its girth uniformly by heating to elevated temperature and cooling.

Polythene Coating Compositions. 845,372. E. I. du Pont de Nemours and Co. Filed, October 18 1957.—Coating compositions and coated pellicular structures, using polythene and cyclized natural rubber on a non-fibrous base sheet.

COMPANY MEETING

Harrisons and Crosfield Ltd.

INCREASED EARNINGS AND DIVIDEND

Sir Leonard C. Paton's Statement

THE annual general meeting of Harrisons and Crosfield Ltd., will be held on December 6 in London.

The following are extracts from the circulated statement by the chairman, Sir Leonard C. Paton, C.B.E., M.C., for the year to June 30 1960:

Group profit attributable to the parent company is £1,664,477. After adding the amount brought forward of £490,674 and making all appropriations, including dividends and a tax charge of £934,956, there remains a carry forward of £515,732.

The directors recommend a final dividend of 9½% on the deferred ordinary stock, increased last year to £2,500,000 by the capitalization of £1,000,000 from reserves. In addition they recommend payment of a bonus of 2½%. This makes the total deferred ordinary distribution 15%, an effective increase of 3%, taking into account last year's smaller deferred ordinary capital. Dividend and bonus absorb £229,688 net, compared with £183,751 net. It is noteworthy that in the last 10 years the net amount paid to deferred ordinary stockholders has nearly trebled.

Earned profits of £1,664,477 before tax (including £98,737 not relating to the year's trading), exceeding last year by £407,367, are the highest, and the balance sheet the strongest, so far submitted. Net current assets, excluding trade investments, exceed £6,500,000. Commercial investments have increased from £927,000 to £1,060,000. Fixed assets, mainly overseas, have risen by close on £170,000. The business is, of necessity, strongly liquid to permit the financing of the two-way trade in which we specialize and to provide for the new developments consistently being added to the group.

Year of Great Activity

The year has been one of great activity. Overseas offices have nearly all increased their contribution earnings, the palm, if any, going to offices where rubber is the main export and where near-boom conditions have prevailed, closely followed by Canada and Australia.

In Malaya, the Pataling Company has linked with Jugra Land and Carey, and together they plan large-scale further development of Carey Island. The Oriental Rubber Company and Lanadron merged into London Asiatic, and New Crocodile into Golden Hope. These mergers are in line with the now general policy of large-scale production units.

In Sumatra, eight plantation companies, to secure consolidation of management and economy in working costs, have merged as wholly-owned subsidiaries into a holding company, London Sumatra Plantations Ltd. The result is a planted area of over 80,000 acres of rubber and oil palms, and constitutes one of the largest units in the plantation industry. So soundly and fairly based were the proposals that in every case more than 90% of shareholders in the integrating companies recorded their agreement.

Overseas Operations

Australia: Last year's slight reduction in business was more than recovered and this year's profit is the highest yet recorded. Importing departments have benefited from the easing of import controls.

New Zealand offices have also benefited from modest relaxation of import controls.

USA: Tea turnover is close to last year's, but profit is lower, the refund of war losses in Japan having come to an end with the payment of $95,000 in 1959. Trading conditions in tea are difficult at present and have not escaped the slowing-down of general economic activity in the US.

Canada: An all-time record of turnover and profit was achieved by H. and C. (Canada) Ltd., despite national tight money conditions.

South Africa: Carst and Walker Holdings (Pty.) Ltd. more than fulfilled expectations by earning a record profit in the first year's joint working. Unless politics fundamentally upset the South African economy, this will prove a rewarding investment to both partners.

Ceylon: The balance of trade has moved against Ceylon and overseas funds have fallen. Our own profits were well maintained.

H. and C. (Borneo) Ltd., report the highest net profit so far attained. Timber, always a fickle market, had a particularly favourable run and, though prices are past the best, satisfactory profits can still be earned, although a price landslide can never be ruled out.

Federation of Malaya: Smallholders account for some 40% of rubber production so that the benefits of high prices have been widely distributed. All our offices have been heavily engaged, and the total cultivated area of the group's agency plantation companies in the Federation is now close to a quarter of a million acres.

Indonesia: Our agency plantation companies have continued to play a valuable part in Indonesian affairs, finding employment for some 20,000 workers, and contributing large sums to the Exchequer by way of Company Tax and other levies. Their exports of rubber and other produce earned for Indonesia no less than £5,000,000 in foreign exchange. This, no doubt, has made its contribution towards the welcome news recently received that facilities for long-overdue profit remittances for 1957 and 1958 are about to be granted.

Tea and Rubber

Tea: Advancing prices marked the closing months of 1959, particularly for plainer sorts, though the total average for all teas sold in London in 1959 at 4s. 6¼d. per lb. was actually a little below 1958. During 1960, best quality teas have realized high prices, but 'reducers' have also been plentiful, resulting in an average of all tea sold in London to mid-October of less than ¾d. per lb. above 1959.

Prospects — The next few months may well see a strong demand in world markets for all tea up to medium quality. Given favourable climatic conditions, world production of tea is capable of further expansion, but the excess must find a market and a price yielding producers a fair return.

Rubber: In 1961, higher stocks, the possibility of further stockpile releases and normal increase from maturing areas of high-yielding material should ensure reasonable sufficiency of natural rubber. More rational price levels have been achieved and it is reasonable to expect that the natural rubber produced will find a market at prices fair to producer and consumer alike. Total 1961 consumption will depend on conditions still to reveal themselves.

Synthetic competition is unsleeping and must be met with corresponding vigilance. The natural rubber industry can face its future cheerfully, provided no effort is spared to grow still finer strains, to process crops within the narrowest limits of standard quality and with every possible technical improvement, to co-operate with customers in meeting special needs, to match in skill and intensity the research behind synthetics, and above all to fight to keep prices moderate and within reasonable limits of fluctuation.

Prospects

Members are entitled to a forecast of earnings, if prophecy is safe. In our case forecast would be folly. Politics in any of half-a-dozen countries can overnight make nonsense of the most conservative economic assessment. Apart from usual hazards, an international trading company cannot defend itself against the latter-day monsters of retroactive taxation, limitation or stoppage of remittances, or long delays in admission of staff, even although such staff operate in the main for the benefit of the host country, providing wages, taxes and earnings of foreign exchange on which any country's advancement so largely depends.

Expansion in the year reviewed has been marked; the organization is in good heart, ready for new endeavours.

Rubber Markets

LONDON

Price changes were fewer and smaller than of late. The market followed Singapore and upturns were fairly well supported. Terminal market activity was of fair volume, but consumer demand remained rather small and selective. Latterly the market was inclined to pause while awaiting US reaction to the Democrat victory in the presidential election.

No. 1 RSS Spot: 26⅝d.-26¾d.
Settlement House:
December 26⅝d.-26¾d.
January/March 26⅝d.-26¾d.
April/June 26⅛d.-26¼d.
July/September 26⅛d.-26¼d.
October/December 26⅛d.-26¼d.
No. 1 RSS cif basis ports:
November 26d.-26⅛d.
December 26⅛d.-26¼d.
January 26⅛d.-26¼d.
Godown:
November 88¼ nominal, Straits cents.

LATEX

Centrifuged 60% latex per gallon in drums, seller, November, 14s. 11d., cif European ports. Spot, seller, 15s. 6d. Bulk, seller, d.w. 14s. 8d. nominal. Creamed, seller, 14s. 8d. nominal, November. Normal, seller, November, 12s. 11d.

AMSTERDAM

The Amsterdam rubber market ruled as under on November 7:

	Guilders per kilo	
No. 1 RMA	Nov. 7	Previous
November	2.61	2.61
December	2.60	2.60
January	2.60	2.60
February	2.60	2.60
March	2.60	2.60
January/March ..	2.60	2.60

Sales: Nil. Tendency: Quiet.

BANGKOK

No. 1 RSS

The price of No. 1 RSS at Bangkok on November 7 was 28.12½ (28.12½) US cents per lb.

DJAKARTA

Some 50 tons of rubber were sold on November 7 at 27 rupiahs per kilo, delivery Semarang. The market closed steady and quiet.

	Rupiahs per kilo	
	Nov. 7	Previous
Spot No. 1 Priok ..	28.50b	28.75b
Spot No. 2 Priok ..	27.25b	27.00b
Spot No. 3 Priok ..	26.25b	26.00b
No. 1 fine pale crepe, spot	29.00b	29.00b

Tone: Steady quiet.

SINGAPORE

After opening about unchanged on November 7, the market ruled very quiet. The turnover was small. Prices fluctuated narrowly and most business was confined to December No. 1 RSS and switching of positions. Later the market steadied on improved buying and short-covering which took prices to the highest level of the morning. The market continued steady throughout the afternoon on general trade buying. Lower sheets failed to follow the uptrend. At the close No. 1 for November delivery, buyers, was 1¼ cents above the November 4 final level at 89 Malayan cents per lb.

	Malayan cents per lb., fob Malayan ports to open ports	
	Nov. 7	Prev. Close
No. 1 RSS, Nov. ..	89¼–89¾	87⅞–88
Dec. ..	90¼–90½	88⅜–88½
No. 2 RSS, Nov. ..	89 –89¼	87½–87⅞
No. 3 RSS, Nov. ..	87⅞–88¼	86½–87⅛
No. 4 RSS, Nov. ..	84½–85½	83½–84½
No. 5 RSS, Nov. ..	79¼–80½	77¼–77¾
No. 1 RSS, Spot ..	89½–90	88 –88¼
No. 3 blanket thick remilled crepe, Nov.	76 –77	75 –76
No. 1 fine pale crepe, Nov.	93 –94	91½–92½
2x thin brown crepe, Nov.	74 –75	73 –74

Tone: Steady.

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums, fob at 172.20d. per gallon.

NEW YORK

The New York rubber market ruled as under on November 7:

DEALERS' PRICES

	US cents per lb., ex-dock	
	Nov. 7	Previous
No. 1 RSS, Nov. ..	31½a	31½n
Dec. ..	31¾a	31½b–31¾a
No. 2 RSS, Nov. ..	31½a	31¾n
Dec. ..	31¾a	31b–31¼a
No. 3 RSS, Nov. ..	31a	31¼n
Dec. ..	30⅞a	30¾b–31a
No. 1 RSS, Spot ..	31¾n	31¾n
No. 3 amber blanket crepe, Nov. ..	26½n	26¾a

FUTURES—REX CONTRACT

	Nov. 7	Prev. Close
November	31.90t	31.80b–32.00a
January ..	31.15b–31.25a	31.25b–31.30a
March ..	30.85b–31.05a	31.10 –31.15t
May ..	30.70b–31.00a	31.02b–31.10a
July ..	30.60b–30.90a	31.00t
September	30.50b–30.80a	30.75b–30.90a
November	30.40n	30.65n

Sales: 21. Tone: Steady.

Futures, after early gains on November 7, declined slightly to the previous close. Dealings for the day were meagre. Traders said interest both in futures and physical rubber was very light, reflecting the reluctance of factories and dealers to take on added commitments before the election day holiday. Futures were about steady in late dealings, but traders noted a softer undertone to physical rubber. Late afternoon consumer interest was small.

CEYLON

No. 1 RSS

The price of No. 1 RSS at Colombo on November 7 was 93 (90) Ceylon cents per lb.

Australian Trade Office

An Australian Trade Delegation led by Mr Philip R. Searcy, Australian Government Senior Trade Commissioner, last Monday opened in Newcastle-upon-Tyne the latest Australian trade office at 12 Mosley Street. This is the seventh area office to be opened in the British Isles, others being at Leeds, Birmingham, Bristol, Glasgow, Manchester and Belfast, with London, the Home Counties and East Anglia operated from Australia House, London.

Genefoam Expand

Genefoam Ltd., Don Mill, Middleton, Manchester, a company in the Vitafoam Group, have taken over the full range of scatter cushions, loose cushion units, Fillafoam, latex foam sheeting and uncovered units, previously made and stocked by Liverpool Latex Cushion Co. Ltd.

Genefoam Ltd. specialize in making any kind of prototype latex foam unit or small quantities of a complicated shape. The capacity of the hand-fabricating department has been doubled to give even better delivery for this specialized service.

Export Opportunities

Porous Plastics for South Africa

John Murray (Pty.) Ltd., 1004/9 Eagle Star House, West Street, Durban, wish to get in touch with UK manufacturers with a view to securing the sole agency for porous plastics materials for filtration purposes. The company, manufacturer's agents, claim in conjunction with their associates in other centres, to offer effective coverage for the whole of the Union.

Manufacturers interested should write direct to the Durban concern, notifying the UK Trade Commissioner, P.O. Box 845, 7th Floor, Barclays Bank Building, Corner Field and Smith Streets, Durban, that they have done so (ESB/21383/59).

Caprolactam Plant for Hungary

The Legation of the Hungarian People's Republic, 46 Eaton Place, London, S.W.1, is interested in hearing from UK firms who could supply one complete plant for the production of 5,000 tons/year caprolactam in 7,800 working hours.

'Komplex,' Budapest V. Dorottya utca 6, are interested in the importation of this equipment. (Ref. ESB/28909/60.)

Enquiries should be addressed to the Board of Trade, Export Services Branch, Theobalds Road, W.C.1, unless otherwise stated.

Industry INTELLIGENCE

Technical Data

Butyl Compounds

Polysar Butyl 301 is a general purpose, high viscosity copolymer of isobutylene and isoprene, designed for such products as inner tubes, mechanical goods, cable insulation and adhesives.

Polysar technical report No. 9:8A, issued by Polymer (UK) Ltd., Walbrook House, Walbrook, London, E.C.4, gives mixing procedure and properties of two low hardness compounds with very high plasticizer content. These compounds mixed and processed very easily and the vulcanizate had good stress-strain properties, resilience and resistance to compression set. Suitable applications for these materials include seals, manhole gaskets, vibration dampers, machine and motor mounts, covered rolls and stoppers.

PVC plus GRP

Artrite Resin LU 112 is a polyester which has been developed to bond glass fibre reinforcement intimately to a suitably prepared rigid vinyl sheet. This produces a strong laminate which combines the toughness, chemical resistance and general inertness of the vinyl sheeting with the structural strength, rigidity and temperature resistance of glass reinforced polyesters.

This combination of properties opens up wide fields of application for both vinyl sheeting and reinforced polyesters and the process is covered by British Patent No. 749,497. Artrite polyester resins may be used free of royalty payments for products manufactured in accordance with this specification.

Further details on the process and materials are given in advance information sheet 110-LU 112 obtainable from Artrite Resins Ltd., 44-46 Kingsway, London, W.C.2.

Blacks in Neoprene

Rubber Chemicals Bulletin No. 34, issued by the Phillips Chemical Co., Akron 8, Ohio, compares the properties of neoprene compounded to equal hardness with different carbon blacks. The blacks concerned are EPC, SRF and MT compared with Philblacks A, O, I and E in Neoprene W at black loadings corresponding to Shore A durometer hardness values of 72 and 85. Properties measured were processing characteristics, tensile strength, elongation, modulus, ageing, dynamic properties, tear resistance, compression set, abrasion, deflection under load and cured pellet-extrusion resistance. The findings of the tests are laid out in a series of charts and tables, enabling a quick comparison to be easily made. These show that the Philblacks provide good abrasion and ageing resistance and low heat generation. Philblack I and E confer the best tensile strength, elongation and tear resistance, while Philblack A is best for high modulus, resilience and resistance to deformation and low compression set.

Machines, Materials and Equipment

Safety on Ladders

Ladders frequently have to be based on uneven surfaces, and packing may be placed under one foot to hold the ladder in a vertical plane. This introduces a danger from possible slipping or breaking of the packing.

To overcome this hazard, a device has been introduced by C. N. Silversides, Linda Vista, Westover Road, Milford-on-Sea, Hants., which can be bolted on to one leg of a ladder to provide an adustable extension. It can be fitted to or removed from the ladder securely and quickly by means of two steel bolts. It is instantly adustable for any extension up to 10in., with a simple positive locking action.

A swivel foot with a non-skid neoprene pad provides firm contact with the ground. Construction is in plated steel and light alloy to provide strength, lightness, and resistance to exposure.

Torque-Flow Pump

A form of industrial pump uses a rotating impeller to impart a swirling motion to the fluid being pumped. The impeller is located in a recess, not forming part of the main through channel of the pump; its action is to create a swirling vortex, into which the incoming fluid is drawn and from which it is then ejected by centrifugal force.

Since this technique of operation leaves a clear through way for the fluid being pumped, the equipment is particularly suitable for pumping slurries and liquids carrying suspended solids, without danger of clogging.

Since the rotating impeller is not situated in the main stream of flow, wear of the mechanism when carrying abrasive fluids is very greatly reduced. Delicate materials such as crystalline slurries are also handled advantageously since there is no element in passage through the pump which is likely to do them damage. It is manufactured by George Scott and Son (London) Ltd., Leven, Fife.

Publications

Monsanto Rubber Chemicals

A catalogue has recently been published by Monsanto Chemicals Ltd., 10-18 Victoria Street, London, S.W.1, listing the main products produced by the company for the rubber industry. The booklet is divided into three sections dealing with accelerators, antioxidants and tred copolymers and ancillary products respectively.

The treatment of each product is necessarily brief but a reference is given in every case to a technical service bulletin or laboratory report which is available, giving further details. Information given is restricted to composition, appearance, specific gravity, crystallizing point, solubility and uses. The structural formulae of most of the materials is also given.

PVC Plasticizers

A thirty-eight page technical service bulletin on plasticizers for PVC has recently been issued by the Geigy Co. Ltd., Rhodes, Middleton, Manchester. In this booklet the chemical structures of the Geigy range of phosphate, phthalate, sebacate and polyester plasticizers are given and a relationship between the structure of the plasticizer and the physical properties of plasticized PVC is discussed. These properties determine the value of a particular plasticizer for a particular purpose, either because of processing characteristics or because of use requirements of the finished product.

Numerous charts and tables are given showing the physical properties of the plasticizers themselves and the properties of plasticized PVC compounds. Similar results are also given for mixed plasticizer systems and methods are suggested for estimating the properties of other mixed systems.

Tool Catalogue

A new and revised catalogue of tools comes from Stanley Works (GB) Ltd., Rutland Road, Sheffield 3.

It gives full details of a wide range of tools, including planes of all types, spokeshaves and scrapers, shapers, braces and drills, vices, rules, hammers, squares and bevels, screwdrivers and complete tool kits. All new lines added to the Stanley range in the last year have been included.

Information on the correct use and maintenance of tools is given and there are over a hundred photographs and instructional drawings.

The catalogue (No. 26, fourth edition) is available free of charge from Stanley Works (GB) Ltd., Rutland Road, Sheffield, 3.

R·J·I·P· CLASSIFIED ADVERTISEMENTS

APPOINTMENTS VACANT

6d. a word, Minimum 10/- Box 2/-

ASSISTANT to engineer required by elastic factory. Age preferably between 24 and 27 with minimum qualifications of H.N.C. (mechanical) and full engineering apprenticeship. Must have draughting experience and be familiar with development work, contracts and service lay-outs. Good working conditions and amenities; pension scheme.—Please write, giving brief details and salary expected, to Staff Officer, (LY) Employment Department, Fort Dunlop, Erdington, Birmingham, 24. (635)

A VACANCY exists for a new junior staff appointment with an old established and progressive rubber hose manufacturer in Hertfordshire as a fitter engineer for supervising the assembling of low pressure and high pressure cotton and wire braided hose and other hose fitting work. Age betwen 30 and 40 years. Previous experience very necessary.—Apply Box 616. (616)

STO-CHEM LTD

Jointly owned by United States Rubber Co. and Witco Chemical Co. Inc.

Experienced latex technologist required for technical sales service group. Good practical knowledge of latex applications in foam and textiles. This is a senior appointment with opportunity for advancement in a new company.—

APPLY TO
MANAGING DIRECTOR
STO-CHEM LTD.
DROITWICH, WORCS. (651)

APPOINTMENTS VACANT

(continued)

CHEMIST or rubber technologist required by an expanding organisation situated in North-West London to work on hot poured and cold applied joint sealing compositions. Experience of natural and synthetic rubbers and other polymers essential. Pension scheme.—Write details, including salary required in confidence to: Personnel Manager, Box 648. (648)

MECHANICAL engineering draughtsman required by elastic factory. Age between 23 and 27, with minimum qualifications of O.N.C. (mechanical). Draughting experience essential; engineering apprenticeship preferred. Good working conditions and amenities; pension scheme.—Please write, giving brief details and salary expected, to Staff Officer, (LY) Employment Department, Fort Dunlop, Erdington, Birmingham, 24. (634)

MEDIUM-SIZED Midland firm at present engaged in producing rubber mechanicals, is about to enter the field of plastics. Applications are invited from technologists with complete knowledge and practical experience of all methods of plastic production, moulding, extruding, etc. Must be capable of organising experimental work, and installing and controlling a new production unit.—Write stating age, full details of experience and salary required to Box 646. (646)

MEDIUM-SIZED Midland firm making rubber mechanicals wishes to extend their experimental organisation. Applications are invited from young technologists with experience in compounding and processing all types of natural and synthetic rubbers, and capable of organising and carrying out experimental work with minimum supervision.—Write stating age, details of experience and salary required to Box 647. (647)

REVOLUTION punch operator (male) B.U.S.M. trained, required urgently. Bonus, canteen and good working conditions. North-West London area.—Applications, stating age, experience, present rate of pay to Box 650. (650)

RUBBER technologist required as sales and technical service representative for distributors of raw materials for the rubber industry. Knowledge of rubber manufacturing industry and rubber technology essential, and knowledge of polymer chemistry an advantage. Willingness to travel essential.—Write with full particulars to: Polymer (United Kingdom) Ltd., Walbrook House, Walbrook, London, E.C.4. (642)

LARKHILL RUBBER COMPANY LTD.

until recently the Rubber Division of C. & J. CLARK LIMITED, SHOEMAKERS

wish to appoint

SHIFT FOREMAN

at their new factory at YEOVIL, Somerset

Supervisory and technical experience in the Rubber Industry is essential.

Starting salary will be in the region of £1,000 - £1,250. Three weeks' holiday and good pension scheme.

Applications are invited and should be made to the Senior Personnel Officer, C. & J. Clark Limited, Street, Somerset, marking your envelope 'Private/JT'. (633)

MACHINERY FOR SALE

6d. a word, Minimum 12/6 Box 2/-

INJECTION moulding machines, 1-oz. Peco 12MS12 fully automatic with nickel cylinder for PVC. Also 8-oz. Stubbe model H 300 VE fully automatic with oversize and normal cylinder.—Box 637. (637)

MANUFACTURERS of roughing machines for rubber sheeting, sponge rubber, splitting machines, leather cloth plant, embossing plates and rollers, spreading machines and presses.—G. L. Murphy Ltd., Imperial Works, Menston, Nr. Leeds. (238R)

MOULDING machines for sale. Peco 9-oz., Windsor 6-oz.—Fred Watkins (Engineering) Ltd., Coleford, Glos. (641)

NEW, unused treble pass medium velocity paxman 'Ultranomic' boiler, 8ft. 6in. dia. x 12ft., arranged for H.P.H.W. process heating. Output 7,000,000 BTU's/HR at 200lbs. per sq. in. Could be easily modified for steam raising at 140lbs. per sq. in. The boiler is arranged for oil firing, but burner not included. Boiler now lying at maker's depot in Essex. Available for immediate delivery at below maker's price.—Apply Box 621. (621)

NO. 11 Banbury with 250 h.p. drive, 8½in. extruder with 120/40 h.p. variable speed drive, 8in. camelback extruder, 4½in. camelback extruder, 3in. extruder.—Reed Brothers (Engineering) Ltd., Replant Works, Woolwich Industrial Estate, London, S.E.18. Tel.: Woolwich 7611 (6 lines). (639)

S.R.S. bench type injection machines with hand, air or hydraulic operation are used widely both at home and overseas. ¾-oz. capacity. Prices from £130. Ideal for fast production and experimental work.—Details from S. R. Seymour and Co., Ltd., Brook Road, Rayleigh, Essex. (644)

STAINLESS steel 'Gardner' jacketed mixer, 6ft. 6in. x 2ft. 3in. x 2ft. 6in., with gear box and V/S motor. Rotary drum blenders, 6ft. 6in. x 5ft., 5ft. 6in. x 4ft. 6in. and 5ft. x 3ft., with motors. Tilting type mixers, 'Z' and 'Naben' blades—all sizes. Aluminium storage tanks 10ft. 6in. diameter x 6ft. 6in. deep (4) and 15ft. 6in. long x 5ft. diameter. Write for stock list.—Leacroft Machinery Co., 1 London Road, Staines. Phone 51012/3. (643)

STEAM-HEATED rubber vulcanizing oven, 4ft. dia. x 6ft. long, in first-class condition.—Box 358 (358)

MACHINERY WANTED

6d. a word, Minimum 12/6 Box 2/-

ADVERTISER requires 36in. or 42in. mill. No objection to elderly machine provided that price is right.—Full details with photograph if possible to Box 638. (638)

AUTOMATICE knife grinding machine required able to take up to 26in. knife.—Box 649. (649)

HYDRAULIC rubber vulcanising press wanted. Upstroking type 600 tons, double ram. 2 daylight, minimum 3in. each. Platens size minimum 54in. x 36in. Steam heated, complete with pump unit and control valve.—Box 636. (636)

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